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VIA HAND DELIVERY

June 23, 2006

Ms. Karen Nickerson
Commission Secretary
Public Service Commission of Delaware
861 Silver Lake Blvd.
Cannon Building, Suite 100
Dover, Delaware 19904

ORIGINAL
DO NOT REMOVE FROM OFFICE

RE: IN THE MATTER OF UNITED WATER DELAWARE INC. FILING THE
CERTIFICATION OF ADEQUATE SUPPLY AND CONSUMER WATER
CONSERVATION PLAN

Dear Secretary Nickerson:

In accordance with Title 26 of the Delaware Code relating to the Water Supply Self-Sufficiency Act of 2003, Chapter 14. Self-Sufficient Water Supply, §1404 relating to reporting requirements for jurisdictional water utilities, enclosed are the original and ten (10) copies of the above mentioned filing of the Certification of Adequate Supply for the projected year 2009.

Should you have any questions concerning the enclosed, please contact me at (302) 252-3035.

Very truly yours,

Susan Skomorucha
General Manager

Enclosures (11)

cc: Mr. Bruce Burcat, Executive Director
Ms. Connie McDowell, Chief of Technical Services
Mr. Walton F. Hill, United Water Vice President – Regulatory Business
Ms. Nancy Trushell, United Water Delaware Engineering Manager

PUBLIC SERVICE COMMISSION

Certification of Adequate Water Supply

United Water Delaware

**2000 First State Boulevard, P.O. Box 6508
Wilmington, DE 19804-6508**

July 1, 2006

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LIST OF EXHIBITS

- Exhibit 1 – Agreement between City of Wilmington and United Water Delaware for Hoopes Releases
- Exhibit 2 – Pump Curves for the Atlas and Chatham Interconnections
- Exhibit 3 – Agreement between City of Wilmington and United Water Delaware Sale and Purchase of Treated Water
- Exhibit 4 – United Water Delaware/Chester Water Authority Post Road Interconnection Flow Records
- Exhibit 5 – Agreement between Chester Water Authority and United Water Delaware Purchase Water Interconnection
- Exhibit 6 – United Water Delaware/United Water Bethel State Line Interconnection Flow Records
- Exhibit 7 – Agreement between United Water Bethel and United Water Delaware
- Exhibit 8 - Agreement between Chester Water Authority and United Water Bethel
- Exhibit 9 – Stanton Water Treatment Plant Allocation Permits (DNREC & DRBC)
- Exhibit 10 – Christiana Water Treatment Plant Allocation Permit (DNREC)
- Exhibit 11 – Christiana Well Allocation Permit (DNREC & DRBC)
- Exhibit 12 – Duffield Report
- Exhibit 13 – Draft Report of Investigations by CH2M HILL
- Exhibit 14 – Consumer Water Conservation Plan

1.0 INTRODUCTION

On August 4, 2003, Governor Ruth Ann Minner signed into law, H.B. 118, the "Water Supply Self Sufficiency Act of 2003". The intent of the law is to ensure that water utilities, both public and private, "...have adequate supplies of water available, even in times of drought, to meet the present and future needs ...". In accordance with H.B. 118 § 1403(a) the Water Supply Coordinating Council has determined, published, and transmitted to the Delaware Public Service Commission the projected demand for each water utility providing water utility services in the drought sensitive area north of the Chesapeake and Delaware Canal. The projected demand for the projected year of 2009 for United Water Delaware (UWDE), as determined by the Water Supply Coordinating Council, is 23.6 million gallons per day (mgd).

This submission to the Delaware Public Service Commission is in fulfillment of the following requirements of H.B. 118:

§1404. Reporting requirements for jurisdictional water utilities: consumer water conservation plans and certifications of adequate supply.

(a) On or before July 1 of a reporting year, each jurisdictional water utility in the drought sensitive area shall file with the Commission:

(1) a consumer water conservation plan (Plan) for the following 3-year period; and

(2) a certification of adequate water supply (Certification) for the projected year.

The Plan and Certification must be applicable to the water utility services provided by the jurisdictional water utility in the drought sensitive area.

2.0 SYSTEM OVERVIEW

United Water Delaware (UWDE) provides water service to a population of approximately 107,000 people within Northern New Castle County, Delaware. The Company provides potable water in three non-contiguous, but interconnected service areas; the North Service area which includes the City of Newport, the South Service area, and the River Road Service area. These areas cover approximately 55 square miles. Boundary areas are identified on system maps that are on file with the Delaware Public Service Commission.

The North Service area consists primarily of residential and commercial customers, with some industrial customers, and is considered to be fully built out. The River Road Service area consists primarily of industrial and residential customers. It is modestly expanding with residential growth. The South Service area consists primarily of residential and commercial customers and there is some growth in this area of these two customer classes. There are also some industrial customers located in the South Service area.

As of December 31, 2005, UWDE was providing domestic water service and fire protection to 32,889 residential customers, 2,622 commercial customers, 66 industrial customers, 54 public authority customers, 441 private fire protection customers, and 3 customers who resell water. The company has a broad service area within New Castle County, Delaware, which includes developments in Brandywine, White Clay Creek, Pencader, Wilmington, New Castle, Millcreek, Newark, St. Georges and Red Lion Hundreds. Because of the build-out of most of our service territory, our annual growth rate over the last three years averaged less than 1%.

As of December 2005, United Water Delaware's distribution system consisted of approximately 523 miles of water mains varying in size from one (1) inch to thirty (30) inches in diameter, approximately 6,600 valves, 2,162 fire hydrants, and 36,472 services. The distribution system also has 29.8 million gallons of storage that is contained in 17 facilities. The breakdown of the different types of storage is: 10 elevated tanks with a combined capacity of 4.7 million gallons, 2 standpipes with a combined capacity of 0.6 million gallons, 4 ground level reservoirs with a combined capacity of 4.5 million gallons, and 1 covered in-ground reservoir with a capacity of 20.0 million gallons. There are 13 booster stations that are strategically located throughout the system to maintain adequate pressures and to serve the various storage tanks.

3.0 PRIMARY SOURCES OF SUPPLY

UWDE's primary sources of supply are two surface water treatment plants. The main treatment facility is the Stanton Water Treatment Plant located in the First State Industrial Park in Stanton, Delaware. This plant draws its water from the White Clay Creek and has a rated treatment capacity of 30 mgd. The Stanton Plant has three raw water intakes. One raw water intake is located solely on the White Clay Creek and two raw water intakes are located immediately downstream of the confluence of the Red and White Clay Creeks.

Pumping conditions on the White Clay Creek are enhanced at the Stanton Water Treatment Plant intakes by the use of an inflatable dam, the Tidal Capture Structure (TCS), which is located approximately 1/2 mile downstream of the intake. This structure is also used to provide a barrier against encroaching chlorides during times of drought.

Pumping conditions and chlorides during drought conditions on the White Clay Creek are also managed by raw water releases from the Hoopes Reservoir. Water releases are metered before entry to the Red Clay Creek, where it then flows naturally to the Stanton Water Treatment Plant intake. Contract terms with the City of Wilmington provide for normal releases up to 5 mgd and/or 200 mg per year. At the discretion of the Commissioner of Public Works, these amounts may be increased, with the release rate not to exceed 10 mgd. The agreement with the City of Wilmington for Hoopes releases is provided in Exhibit 1.

United Water Delaware also has a smaller treatment facility, the Christiana Water Treatment Plant, which is located at Smalley's Dam on the Christina River. This plant is used for peaking capacity and provides limited redundancy to the Stanton Water Treatment Plant. The rated treatment capacity of this plant is 6 mgd. When operated, the plant's normal production is between 3 and 4 mgd.

4.0 SUPPLEMENTAL SOURCES OF SUPPLY

4.1 Interconnections

The Company has a total of 10 interconnections with area water suppliers which can supplement the UWDE system. One with Chester Water Authority (CWA), one with United Water Bethel (UWB), three with the City of Wilmington, and five with Artesian Water Company.

UWDE has three interconnections with the City of Wilmington. The Atlas interconnection, located on Christiana Avenue has a pumping capacity of 1800 gpm (2.6 mgd). The Chatham interconnection, on Chatham Road has a pumping capacity of 800 gpm (1.2 mgd). The Silverside Interconnection, located at the

Certification of Adequate Water Supply

intersection of Route 202 and Silverside Road is free flow. Delivery rates through this interconnection vary depending on the difference between Wilmington's and UWDE's system pressures. Pump curves for the Atlas and Chatham interconnections are provided in Exhibit 2. The interconnection agreement is provided in Exhibit 3.

UWDE has one interconnection with the Chester Water Authority which is located on Post Road in Claymont. This interconnection has a capacity of 0.5 mgd. Flow through this interconnection averages 207 gpm (0.3 mgd). Records of flow through this interconnection and the interconnection agreement are provided in Exhibits 4 and 5 respectively.

UWDE receives daily supply from United Water Bethel (UWB) at the State Line interconnection on Route 202 near the Pennsylvania state line. UWB's interconnection with the Chester Water Authority requires a minimum purchase of 1 mgd. UWDE's agreement with UWB requires UWDE to purchase the difference between 1mgd and UWB's consumption. Records of flow through this interconnection and the interconnection agreement are provided in Exhibits 6, 7 and 8 respectively.

UWDE has five interconnections with Artesian Water Company for the purpose of emergency use. They have a combined capacity of 9 mgd. There is no agreement in place for the interconnections between UWDE and Artesian Water Company.

4.2 Aquifer Storage Recovery

United Water Delaware is increasing its supply with the addition of an Aquifer Storage Recovery (ASR) facility in the company's River Road service area. ASR is a proven technology throughout the United States and other countries. The facility will store surface water underground, in a confined aquifer, during the lower demand months. The stored water will be recovered and delivered to customers during higher demand months. The facility will consist of three injection-recovery wells (ASR-1, ASR-2 and ASR-3) and one treatment building. By 2009, the facility will provide an additional 2.5 mgd. When fully operational, the ASR facility will provide a total of 3 mgd of drinking water to the River Road service area during the summer season. Initial aquifer testing has been completed and the facility is in the design phase. ASR-1 is scheduled to be in service in 2007, ASR-2 and ASR-3 are scheduled to be in service in 2008. These wells, will provide operating flexibility to UWDE in meeting projected demands of 2009.

4.3 Other Potential Sources

As has been the practice for many years, United Water Delaware will continue to investigate the feasibility of additional improvements to its sources of supply. These may include projects such as, but not limited to, additional interconnections with neighboring suppliers, raw water storage, and improvements to facilities that would enable additional raw water purchases. At the conclusion of DNREC's

Certification of Adequate Water Supply

groundwater study, if additional groundwater is determined to be available in Northern New Castle County, United Water will also consider groundwater development for added supply.

5.0 DETAILS OF CERTIFICATION OF SUPPLY

United Water Delaware can meet the 2009 projected demands of 23.6 million gallons per day using the Stanton and Christiana Water Treatment Plants. Additional sources of supply, interconnections and the ASR facility, provide added supply. The added supply provides operating advantages to the company when chlorides become problematic.

5.1 United Water Delaware Sources of Supply Table

	Available 2006	Available 2009
Stanton WTP	20.60	20.60
Christiana WTP	3.25	3.25
City of Wilmington Interconnections	3.80	3.80
CWA Interconnection	0.24	0.24
UW Bethel Interconnection	0.43	0.32
ASR	0.00	2.5
Total	28.32	30.71

Projected demand per the Water Supply Coordinating Council = 23.6 mgd.

5.2 Stanton and Christiana Water Treatment Plants

To substantiate the reliability of the Stanton and Christiana Water Treatment Plants, UWDE retained Duffield consultants to provide analysis of the source water and chloride data for these plants. As was done throughout this certification, Duffield took a conservative approach and used peak chloride levels in the study to determine augmentation needed from Hoopes Reservoir. The regulations for chlorides, a contaminant which may cause esthetic quality effects of taste, odor, and color, are based on daily averages, which would be lower than the levels used by Duffield. The study was conducted by applying the stream conditions during the drought of 2002, to simulate drought of record conditions. The conclusion of the Duffield report reads:

CONCLUSION

This report was completed at the request of United Water Delaware to evaluate the impact source water availability, during the drought of record, would have on its ability to reliably produce finished water to meet projected 2009 daily demand of 23.6 million gallons. This request was prompted by the requirement for UWDE to prove self-sufficiency of water supplies to the Delaware Public Service Commission.

The Stanton supply relies on the natural stream flow, tidal water capture and augmentation of flow by releases from Hoopes Reservoir. The analysis of the Stanton supply reveals that source water is available for all but one day (August 21) during the drought of record to allow treatment of 20.6 mgd at the Stanton Plant. To achieve quantity and chloride level objectives, the system requires flow augmentation from Hoopes Reservoir on 17 days for a total release of 96.5 mg.

The Christiana supply relies on the natural stream flow, storage in Smalley's Pond, and supplemental flow from groundwater supplies and/or interim tidal-water pumping. The analysis of the Christiana supply reveals that the Christina River is available in excess of 3.25 mgd during most of the drought of record for treatment at the Christiana Plant and distribution of finished water. However, during the 75 day drought period analyzed, the natural Christina River flow alone was insufficient to provide 3.25 mgd for 19 days, requiring supplemental sources to be used. Analysis confirmed the total available resources and operational practices to maintain storage can provide sufficient supply to the Christiana Water Treatment Plant.

The Stanton and Christiana systems have more than sufficient supply to easily meet projected demands during the great majority of conditions. The analysis of source availability during the drought of record (July 1, 2002 - September 15, 2002) demonstrates that the supplies for the Stanton Plant and the Christiana Plant are sufficient to meet the projected 2009 demand of 23.6 million gallons even during such drought conditions.

The Duffield report shows that, absent one day (August 21), UWDE would be capable of producing 20.6 mgd from the Stanton WTP using no more than 10 mgd of water from Hoopes reservoir. Under the conditions presented on that day, 11.8 mgd from Hoopes would be needed to supply 20.6 mgd at the Stanton intake and maintain 230 ppm chlorides. To address supply on that day, UWDE would take alternative operating measures to reduce the demands on the Stanton Plant. These measures may include such operational actions as increasing the amount of water taken from interconnections and/or utilizing storage to meet demand. The Duffield report also shows that the Christiana WTP could produce 3.25 mgd. The total supply from UWDE's surface water treatment plants combined is 23.85 mgd. Allocation permits and the Duffield report are provided in Exhibits 9, 10, 11 and 12.

5.3 City of Wilmington Interconnections

Under normal operating conditions, these interconnections are closed. The interconnections are available to be opened when needed. For purposes of certification, only supply from the Atlas and Chatham interconnections is included. The Silverside interconnection is not included because its delivery capacity is directly dependant on system operating pressures and data is not available to determine a reliable flow rate. Supplies from the Atlas and Chatham interconnections with the City of Wilmington are 2.6 mgd and 1.2 mgd respectively for a total supply of 3.8 mgd.

5.4 Chester Water Authority Interconnection

Under normal operating conditions the Post Road interconnection is open an average of two weeks per month. This operation meets UWDE's obligation to purchase a minimum of 3.75 mg/month. If desired, UWDE can leave the interconnection open after the minimum purchase requirement has been met. Flow through this interconnection averages 297,500 gpd (0.3 mgd). In determining supply, UWDE has elected to be conservative and applied a 20% reduction factor to the available supply through the interconnection. This is equivalent to the reduction in demand that the Chester Water Authority requested during the drought of 2002. Applying the 20% reduction, the supply from the Post Road interconnection is 0.24 mgd.

5.5 United Water Bethel Interconnection

UWDE receives daily supply from United Water Bethel (UWB). The daily supply available from this interconnection in 2009 will be dependant on UWB's growth. This is conservatively determined by plotting historical drought month supply (July through September) for the past three years, and applying a straight-line trend to 2009. Because supply from this interconnection originates from the Chester Water Authority, UWDE has applied a 20% reduction factor as was done for Post Road. The supply from the UW Bethel interconnection is considered to be 0.32 mgd. The data and trend graph depicting this projection, along with the interconnection agreement are provided in Exhibits 6 and 7.

5.6 United Water Delaware ASR Facility

By 2009, UWDE's ASR facility is expected to be on line and serving as an additional source of supply. Each of the three planned wells are expected to provide a minimum of 700 gpm (1.0 mgd) for a total of 3.0 mgd. While it is normal for ASR facilities to deliver nearly all stored water in their first full season of operation, UWDE has taken a conservative approach and assumed that the minimum supply from this facility will be 85% of full capacity in the summer of 2009. Thus the supply from the ASR facility included in the certification is 2.5 mgd. The cover letter and Executive Summary from the Draft Report of Investigations on this project by CH2M HILL, are provided in Exhibit 13.

6.0 CONSUMER WATER CONSERVATION PLAN

As part of the required filing, United Water Delaware's Consumer Water Conservation Plan is provided in Exhibit 14.

7.0 CERTIFICATION OF WATER SUPPLY SELF-SUFFICIENCY

I, Robert J. Iacullo, do hereby certify that, to the best of my knowledge and by the documentation provided in this report, United Water Delaware has sufficient sources of water supply available to meet projected demands through a drought of record in northern New Castle County through the year 2009.

Robert J. Iacullo
Robert J. Iacullo, Chief Operating Officer

June 21, 2006
Date

Susan Skomorucha
Susan Skomorucha, General Manager

6/22/06
Date

Nancy J. Trushell, P.E.
Nancy J. Trushell, Engineering Manager

6/22/06
Date

Exhibit 1

**Exhibit 1
Agreement between City of
Wilmington and United Water
Delaware for Hoopes Releases**

AGREEMENT BETWEEN THE
CITY OF WILMINGTON AND UNITED WATER DELAWARE INC.

THIS AGREEMENT, made this 28th day of August, 2002 by and between the CITY OF WILMINGTON, a municipal corporation of the State of Delaware ("the City"), and UNITED WATER DELAWARE INC., a Delaware corporation ("United").

WHEREAS, the City has a source of unfinished (raw) surface water located at Hoopes Reservoir which is collected from the Brandywine River in accordance with the Delaware River Basin Commission ("DRBC") regulation; and

WHEREAS, United is an investor-owned water utility, regulated by the Delaware Public Service Commission ("PSC"), serving water customers in New Castle County; and

WHEREAS, United has a demonstrated need for additional supplies of unfinished water at certain times during emergency and/or drought conditions.

NOW, THEREFORE, the City and United, in consideration of the mutual promises and covenants set forth herein, agree as follows:

1. Purpose: The City shall release and sell, and United shall accept and buy, unfinished water to supplement United's water supplies during emergency and/or drought conditions subject to the terms and conditions set forth herein. The City shall release the water from Hoopes Reservoir into the Red Clay Creek so that United may process the unfinished water at United's treatment facilities.

2. Annual Reservation and Fee Structure:

(a) Annual Reservation Charge: In consideration of the City making the supply of water available to United as set forth within, United agrees to pay an annual reservation (or standby) charge to the City of Twelve Hundred Dollars per One Million Gallons

(\$1,200 per 1,000,000 Gal). The annual reservation charge shall be determined by multiplying (1) the volume of water reserved for United in any one annual period, times (2) \$1,200.

United shall make its initial request for the specific amount of the annual reservation of water as contemplated by this Agreement on or before March 1, 2003, and by March 1 of each contract year thereafter. The City will provide written acknowledgement confirming the volume reserved by United within thirty (30) days upon receipt thereof. At no time during the term of this Agreement shall the annual reservation exceed Two Hundred Million Gallons (200 MG) or fall below Fifty Million Gallons (50 MG).

(b) Usage Charge: United agrees to pay to the City a usage charge of Four Hundred Dollars per One Million Gallons (\$400 per 1,000,000 Gal) of unfinished water. This charge shall be in addition to the annual reservation charge and shall be applied to the actual quantity of water released by the City on request of United. United agrees that all such quantities of water released by the City into the Red Clay Creek pursuant to the terms of the Agreement shall be measured and determined by the City through its Department of Public Works.

(c) Excess Release Charge: In the event that United requests the City to release water in excess of the agreed upon reservation volume within the applicable contract year, and the City agrees to make an additional release, United shall pay the City an excess release charge of Two Thousand Dollars per One Million Gallons (\$2,000 per 1,000,000 Gal) for such excess release.

(d) Metering: The City shall provide a meter with a continuous recording-totalizer device to record the volume of water released. Said meter and appurtenances shall be tested at least annually by the City. United may, upon reasonable request to the City, test or have the meter tested. The cost of meter tests performed by United or at its request, other than the annual test performed by the City, shall be paid by United. If said meter shall be found to be in error by more than allowable AWWA standards, the current and two preceding billings for water released, if appropriate, shall be adjusted to reflect the correct usage, and the City shall reimburse to United the reasonable cost of the test that disclosed such information.

3. Limitation on Rate of Release: The volume of unfinished water provided by the City to United shall not exceed a daily amount of Five Million Gallons (5,000,000 Gal), such volume of water to be processed by United at its facilities. However, volumes may be adjusted by the Commissioner of Public Works if warranted in the sole discretion of the City. The release of unfinished water by the City shall not exceed an instantaneous flow rate of Ten Million Gallons (10,000,000 Gal) per Day; provided, however, the City shall be responsible for installing any necessary instrumentation to measure instantaneous flows.

4. Payment: Payment of the annual reservation charge shall be made by United to the City in full within thirty (30) days of the submittal of the request for the annual water reservation. Payment for any water released shall be made by United within thirty (30) days of the date of the invoice rendered by the City.

5. Indemnification: United agrees to defend, indemnify, and save harmless the City from any and all claims, actions, fees, charges, and expenses of any kind, including attorney's fees, caused by the negligence of United or arising out of this Agreement and

imposed by the DRBC, the Delaware Department of Natural Resources and Environmental Control ("DNREC") or any other federal, state or local authority pursuant to any and all applicable federal, state or local statutes and regulations.

6. Late Payment: In the event United fails to pay on the due date all sums due and owing to the City at any time during the term of this Agreement, United shall pay to the City interest at the then current prime rate for the Wilmington Trust Company and any such reasonable costs incurred by the City as determined by the City's Director of Finance.

7. Change of Law. In the event any federal, state, or other agency having jurisdiction over the subject matter of this Agreement ^{and} by the City imposes requirements upon the City whether pursuant to existing or future laws, statutes, or regulations which render impossible the performance of this Agreement, then upon six (6) months notice to the other party, the party affected by such regulations shall be entitled to declare this Agreement null and void, save any outstanding payment owed hereunder. Should such requirements create a situation of less than total impossibility, United may at its option continue this Agreement by agreeing to pay, incur, or otherwise satisfy any additional expenses or costs caused by such requirements, and an amended written agreement may be entered into by the parties setting forth the revised undertaking. If acceptable terms cannot be agreed upon within three (3) months after the imposition of said conditions or additional requirements, then this Agreement shall become null and void save any outstanding payments owed to the City. During the negotiation period, the City, at the discretion of the Commissioner of Publics Works, may refuse to release any additional water if, in his opinion, such release would be detrimental to the City or its water customers.

DBReed
mt

8. Destruction of Water System: In the event that there shall be a significant destruction or disablement of the City's water system or any part thereof, this Agreement may be held in abeyance by the City, without penalty, upon written notice to United, until such time as said destruction or disablement is sufficiently repaired to allow City to render performance hereunder. If such destruction or disablement cannot be repaired within a reasonable time, this Agreement shall be terminated; provided, however, that the City shall upon such termination refund to United any annual reservation charges on a pro rata basis or usage charges for water not used by United as of the date of termination.

9. Treatment Required: United understands that the water supply contemplated is unfinished, that treatment by United is required, and United agrees to defend, indemnify, and hold the City harmless, including the cost of the defense of all claims and litigation, arising from or alleging unsuitability or contamination of any water supplied by United to its customers.

10. No Assignment: The parties hereto shall not assign, subcontract or otherwise transfer the Agreement or any portion thereof except with written consent of both parties; provided, however, that if the stock or assets of United are transferred to another entity acquiring all or substantially all of same, and such entity assumed all of the obligations of this Agreement in writing, then such assignment shall be effective upon written notice to the City.

11. Complete Agreement: The Agreement contains the full and complete understanding between the City and United and supersedes all previous agreements and/or proposals, whether oral or written.

12. Term: The term of this Agreement shall commence upon execution of this Agreement and shall automatically reach termination on midnight December 31, 2007, unless further extension is mutually agreed by the parties prior to such time and date.

13. This Agreement shall not impact or restrict any rights that United may have to purchase water, finished or unfinished, from the City, under an agreement between United and the City dated October 2, 2000.

14. IN WITNESS WHEREOF, the parties hereto have duly executed this Agreement on the day and year aforesaid in Wilmington, Delaware.

Signed, sealed and delivered
in the presence of:

Peggy A. B. [Signature]
Witness

THE CITY OF WILMINGTON

[Signature] M. Baber
Mayor

ATTEST:

Maribel Ruiz
City Clerk

UNITED WATER DELAWARE INC

[Signature] J. [Signature]
Witness

BY: [Signature] (Seal)
President

ATTEST:

[Signature] C. [Signature]
Secretary

Approved as to form 9/27, 2002

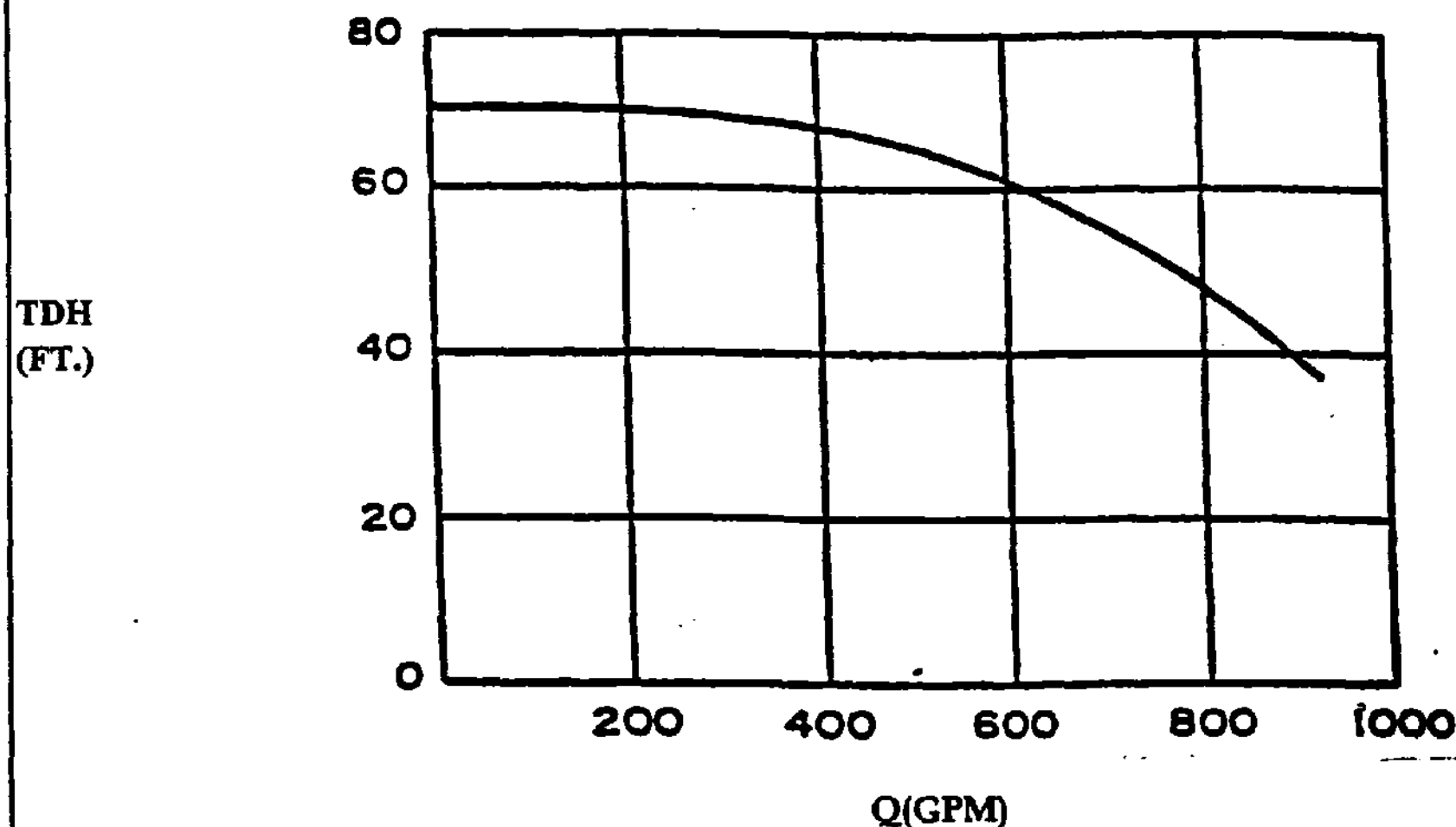
[Signature] M. [Signature]
Assistant City Solicitor

Exhibit 2

**Exhibit 2
Pump Curves for the Atlas and
Chatham Interconnections**

UNITED WATER DELAWARE
PUMP DESCRIPTION

Location: Chatham Booster
 Pump: #1
 Duty: Pumps from City of
 Wilmington to the Graylyn
 Crest Service Level

Pump Characteristic Curve


Motor Data	
Manufacturer:	Goulds
Type:	Induction
HP:	15
Volts:	230
Amps:	18
RPM:	1200
Phase:	3
Cycles:	60
Frame:	284TSC
Model:	
Kind:	TEFC
Serial #:	
Starter:	Benshaw, Reduced Voltage Soft Start

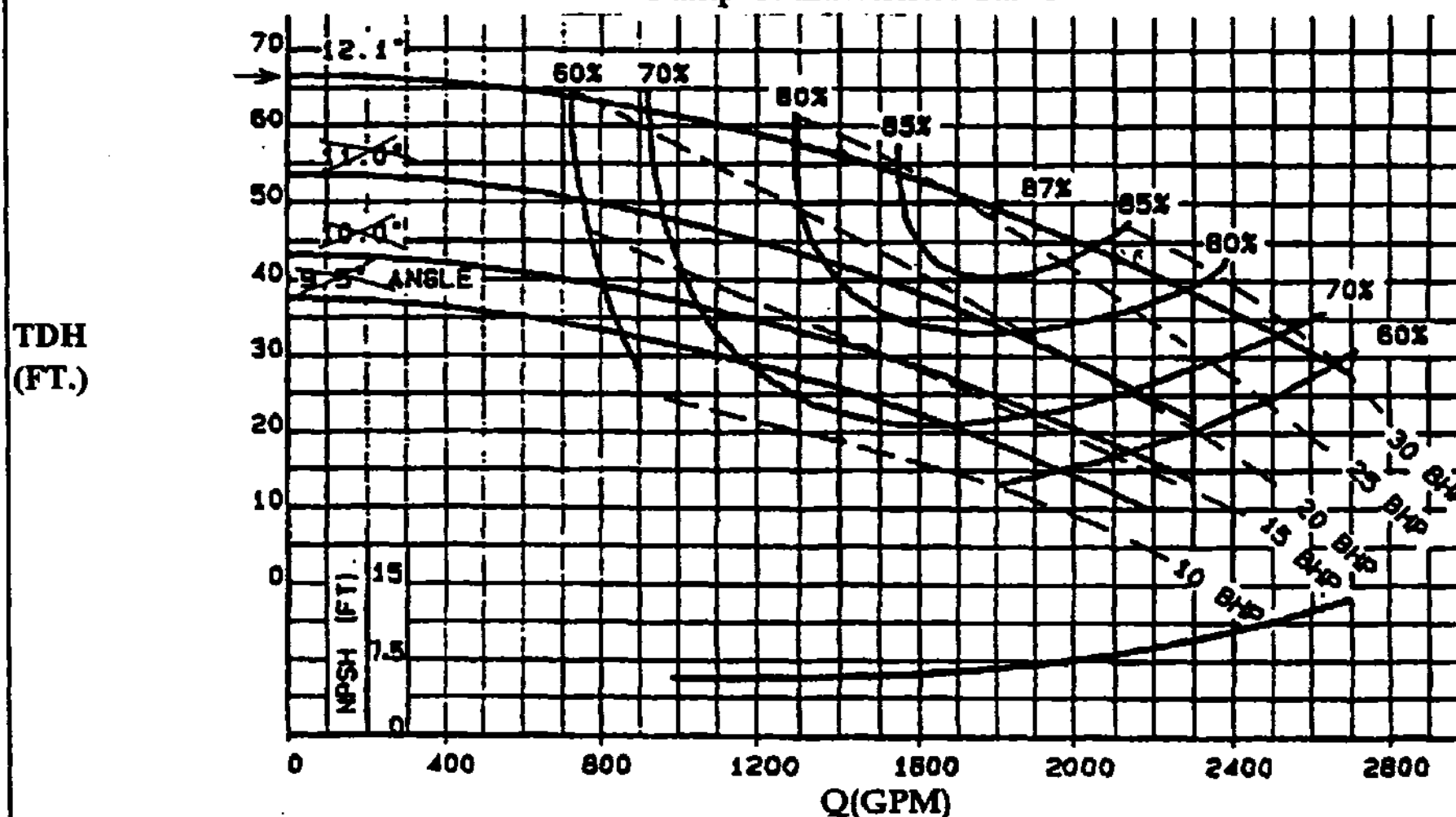
Pump Data	
Manufacturer:	Goulds
Type:	Centrifugal
GPM:	800
Head:	50
Efficiency:	73%
RPM:	1200
Impeller Diameter:	12.5
Suction Diameter:	6
Discharge Diameter:	4
Kind:	In-Line
Serial #:	787C222
NOTE: Operational experience indicate more than 800 gpm. New curve to be provided if field testing validates higher flow.	

Remarks: Installed in 1987.

UNITED WATER DELAWARE PUMP DESCRIPTION

Location: Atlas Interconnection
Booster
Pump: #1
Duty: Pumps from City of
Wilmington to North
System

Pump Characteristic Curve



Motor Data

Manufacturer:
Type:
HP: 30
Volts: 480
Amps:
RPM: 1200
Phase: 3
Cycles: 60
Frame:
Model:
Kind: Vertical ODP
Serial #:
Starter: YasKawa VFD

Pump Data

Manufacturer: Paco
Type: Centrifugal
GPM: 1800
Head: 49'
Efficiency: 87%
RPM: 1200
Impeller Diameter: 12.1"
Suction Diameter: 10"
Discharge Diameter: 10"
Kind: Vertical In-Line
Serial #:

Remarks:

Exhibit 3

**Exhibit 3
Agreement between City of
Wilmington and United Water
Delaware – Sale and Purchase of
Water**

AMENDMENT TO AGREEMENT
SALE AND PURCHASE OF TREATED WATER

This Amendment ("Amendment") made as of the 2nd day of October, 2000, by and between the City of Wilmington ("City"), a municipal corporation of the State of Delaware, and United Water Delaware Inc. ("Company"), formerly named Wilmington Suburban Water Corporation, a corporation of the State of Delaware,

WITNESSETH:

WHEREAS, City and Company are parties to an Agreement – Sale and Purchase of Treated Water dated March 10, 1992 ("Agreement"); and

WHEREAS, by letter dated February 27, 1997, the City advised the Company that the work contemplated to be performed by the City pursuant to the Agreement was complete and requested that the Company begin to make payments under the Agreement; and

WHEREAS, by letter dated May 1, 1997, the Company advised the City that it would not be able to begin payments under the Agreement until, among other matters, approval of the Agreement was received from the Delaware Public Service Commission ("PSC") pursuant to Paragraph 14 of the Agreement; and

WHEREAS, in various correspondence and meetings between the City and the Company, the City advised the Company that it believed that lack of approval of the Agreement by the PSC and lack of approval by the PSC of the Company's payments being included in the Company's rates did not excuse the Company from making payments under the Agreement; and

WHEREAS, the City and the Company have held numerous meetings and exchanged correspondence in attempts to resolve the matters set forth above and other issues relative to the Agreement; and

WHEREAS, City and Company wish to resolve their dispute by amending the Agreement on the terms and conditions set forth;

NOW, THEREFORE, in consideration of the mutual agreements herein contained, the City and Company agree as follows:

1. City and Company agree that, subject to Paragraph 3 hereof, for the purposes of Paragraph 6 of the Agreement, the WSWC Project Cost, as such term is defined in the Agreement, is \$3,379,371. Subject to Paragraph 3 hereof, the Company shall pay the WSWC Project Cost over a thirty (30) year period as of January 1, 2000, in the amount of \$21,677 per month. The initial payment by the Company shall be made no later than ten (10) days following the execution of this Agreement in the total amount equal to the number of months that have elapsed since January 1, 2000, multiplied by the Monthly Payment. Thereafter, the Company shall pay the City the Monthly Payment no later than the first day of each month during the remainder of the thirty (30) year term. The City waives any claim against the Company for interest, damages or other charges from April, 1997 on the WSWC Project Cost.

2. Prior to December 15, 1999, the City provided to the Company a certification by a licensed professional engineer that the required water system improvements have been completed in accordance with the Agreement and will produce an additional ten (10) million gallons per day ("MGD") of treated water. Such certification has been accepted by and is satisfactory to the Company.

3. Prior to the execution of this Amendment, the City provided to the Company certification of the WSWC Project Cost by the project's consulting engineer in form acceptable to the Company. The payments to be made by the Company shall begin as set forth in Paragraph 1 hereof.

4. Paragraph 7 of the Agreement is deleted in its entirety and the following paragraph 7 is substituted therefor:

7. At any time during the term of this Agreement, the Company may elect, at its sole option and expense, to construct one or more additional interconnection(s) from the City's water system to the Company's water system that would enable the Company to take up to an additional seven (7) MGD of treated water under the terms and conditions of this Agreement. The Company shall construct and maintain a meter pit near or at such additional interconnection(s). Such additional interconnection(s) and meter pit shall be and at all times remain the property of the Company. The location of the additional interconnection(s), together with the plans and specifications for such interconnection(s) that may be constructed pursuant to this paragraph shall be selected by the Company, subject to review and approval of the City, which shall not be unreasonably withheld.

5. Paragraph 8 of the Agreement is deleted in its entirety and the following substituted therefor:

The City agrees to provide treated water pursuant to this Agreement through the existing interconnections between the Company

and the City, in quantities as requested by the Company but not to exceed a maximum of three (3) MGD; provided, however, if during the term of this Agreement, the Company elects to construct additional interconnection(s) pursuant to paragraph 7 of this Agreement, the amounts of treated water to be provided by the City pursuant to this Agreement shall be increased to permit the Company to take a total maximum amount of ten (10) MGD pursuant to this Agreement, with the maximum instantaneous rate not to exceed seven thousand seven hundred gallons per minute (7,700 GPM). The Company agrees to pay the City for water purchased on a monthly basis, utilizing that rate per thousand gallons of water supplied which is equal to 70% of the industrial in-City customer usage rate. (At the present time the industrial in-City customer rate is \$1.939/1000 gallons). The rate payable by the Company is subject to adjustment from time to time whenever the City amends its water usage charges for industrial in-City customers, provided that the percent increase of such adjustments shall be consistent with the adjustments to the rate for industrial in-City customers.

6. The first sentence of paragraph 14 of the Agreement, concerning approval of the Delaware Public Service Commission, is deleted in its entirety.

7. Paragraph 9 of the Agreement is amended by deleting the figure "22 MGD" in each of the last two sentences and substituting the figure "25 MGD" in lieu thereof.

8. The Company shall provide and maintain in effect during the term of this Agreement a performance bond substantially in form attached hereto as Exhibit A or a substitute form of guarantee reasonably acceptable to the City.

9. Except as specifically amended herein, the Agreement shall remain in full force and effect in accordance with its terms.

10. This Amendment shall be governed by and construed and enforced in accordance with the laws of the State of Delaware.

11. This Amendment shall be binding upon and inure to the benefit of the parties hereto and their respective successors and assigns.

12. The City represents, warrants and covenants to the Company as follows:

(a) The City has full power and authority to carry out and perform its undertakings and obligations as provided herein.

(b) The execution and delivery by City of this Amendment, and the consummation of the transactions contemplated by this Amendment have been duly authorized by all proper or requisite proceedings of the City and do not conflict with any applicable law or regulation.

13. Company represents, warrants and covenants to the City as follows:

(a) Company has full corporate power and authority to carry out and perform its undertakings and obligations as provided herein.

(b) The execution and delivery by Company of this Amendment and the consummation of the transactions contemplated by this Amendment have been duly authorized by all proper or requisite proceedings of Company.

IN WITNESS WHEREOF, the City has caused these presents to be signed in its corporate name by its Mayor, and its corporate seal duly attested by the City Clerk to be hereunto affixed; and the Company has caused these presents to be signed by its duly authorized officer, and its corporate seal duly attested by its Assistant Secretary to be hereunto affixed, all as of the day and year first above written.

CITY OF WILMINGTON

By: James H. Sills, Jr.
James H. Sills, Jr., Mayor

ATTEST:

By: Maribel Ruiz
Maribel Ruiz, City Clerk

UNITED WATER DELAWARE INC.

By: Anthony A. Langley
Anthony A. Langley, General Manager & Vice President

ATTEST:

By: Susanne O'Connell
Assistant Secretary
Susanne O'Connell

SUBSTITUTE NO. 1 TO ORDINANCE NO. 92-005

AN ORDINANCE TO AUTHORIZE AN AGREEMENT
 BETWEEN THE CITY OF WILMINGTON AND
 WILMINGTON SUBURBAN WATER CORPORATION
FOR THE SALE AND PURCHASE OF TREATED WATER

ponsors:

Public
 Works
 Committee
 &
 Finance
 Committee

Council
 Members
 States
 Oppiti
 Cott
 Zerwinski
 Artkowski
 'Donnell

WHEREAS, pursuant to Section 5-404 of the City Charter, the City of Wilmington is authorized to enter into contracts for the supply of water outside the City limits; and

WHEREAS, pursuant to Sections 3-1, et seq., of the City Code, the City has the power to issue bonds to finance the cost of improvements to its water supply system; and

WHEREAS, the City and Wilmington Suburban Water Corporation ("the Company") intend to enter into an agreement ("the Agreement") which provides, in part, that

- 1) the City, with the financial assistance of the Company, will construct certain improvements to the City's water supply system;
- 2) the City will sell and the Company will buy up to a maximum of 10 million gallons of treated water per day; and
- 3) the Company will construct and maintain, at its own expense, a pipeline to convey said treated water; and

WHEREAS, the Agreement, a copy of which is attached hereto as Exhibit A, shall be for a minimum period of 30 years.

THE COUNCIL OF THE CITY OF WILMINGTON HEREBY ORDAINS:

SECTION 1. The Agreement between the City of Wilmington and Wilmington Suburban Water Corporation for the sale of treated water, a copy of which is attached hereto as

Exhibit A, is hereby approved and the Mayor and the City Clerk are hereby authorized and directed to execute as many copies of said Agreement, as well as all additional understandings related thereto, as may be necessary.

SECTION 2. This Ordinance shall be effective upon its passage by City Council and approval by the Mayor.

First Reading. . .February 6, 1992
Second Reading . .February 6, 1992
Third Reading. . . MAR 5 1992
Passed by City Council, MAR 5 1992

/s/ James M. Baker
President of City Council

Attest: /s/ Leo T. Marshall
City Clerk

Approved: MAR 9 1992

/s/ Daniel S. Frawley
Mayor

Approved as to form
February 26, 1992

Mary P. Smith
Assistant City Solicitor

SYNOPSIS: This Ordinance authorizes the City to enter into an agreement with Wilmington Suburban Water Corporation ("the Company") for the sale of treated water, in which the City, with the financial assistance of the Company will construct certain improvements to the City's water supply system, the City will sell to the Company a maximum of 10 million gallons of treated water per day, and the Company will construct and maintain, at its own expense, the pipeline necessary to convey said treated water.

AGREEMENT
Sale and Purchase of Treated Water

THIS AGREEMENT, made this 10th day of March, 1991², by and between the CITY OF WILMINGTON, a municipal corporation of the State of Delaware, (hereinafter "City") and WILMINGTON SUBURBAN WATER CORPORATION, a Delaware corporation, (hereinafter "Company").

WHEREAS, the City has a source of water collected from the Brandywine River in accordance with the Delaware River Basin Commission (hereinafter "DRBC") regulations, and has treatment facilities to treat some portion of those waters; and

WHEREAS the Company is a water utility, regulated by the Delaware Public Service Commission (hereinafter "PSC"), serving water customers in New Castle County, Delaware; and

WHEREAS the Company has a demonstrated need for an additional ten million gallons per day of treated water in the future; and

WHEREAS, the City has an adequate supply of untreated water and the City is willing to make specific modifications to the City's Porter Water Treatment Plant and the Company is willing to construct a pipeline from the City's Porter Water Treatment Plant to the Company's Edgemoor Reservoir, so that the City can treat and deliver up to ten million gallons per day of treated water to the Company; and

WHEREAS, the City desires to sell, and the Company desires to purchase, treated water as provided herein.

NOW, THEREFORE, the City and the Company, intending to be legally bound hereby, in consideration of the mutual promises and covenants set forth herein, agree as follows:

Design Review Committee

1. The City and Company agree to form a Design Review Committee (hereinafter "Committee") consisting of four persons and each party agrees to designate, in writing, within 30 days of execution of this Agreement, two of its full-time paid employees as its representatives, to serve on such committee, and provide a copy of such designation to the other party. The committee shall keep written records of its decisions and shall require concurrence of three members to authorize actions. The committee shall:

- a. Specify (and amend as necessary) the maximum engineering fee to be financed by proceeds of the Bonds (as hereinafter provided) to reimburse the City in respect of the City's costs for retaining a consulting engineer to design, prepare plans and specifications for and to inspect construction of the City facilities (including improvements to existing facilities) called for hereunder, it being contemplated that such reimbursement level shall be determined based on normal costs of consultants who perform this type of work and ASCE curves.

- b. Review design parameters for the City and Company facilities.
- c. Approve costs, plans and specifications for the City facilities.
- d. Assist the City, as appropriate, to select a contractor to construct the City facilities via the City's bidding procedure.
- e. Assist the City, as appropriate, to arrange for the financing of the construction of the City facilities.
- f. Approve construction schedules.
- g. Apply for all necessary permits, licenses and approvals from various agencies to permit the construction and operation of the City facilities and the Company facilities covered hereby.
- h. Take such other actions as may be reasonably necessary to assist in carrying out the project described in the System Improvements Study.

City Facilities

2. The following primary facilities with appurtenances, designed to enable the City to sell an additional ten million gallons of treated water a day shall be constructed by the City in accordance with the terms hereof:

- I. Porter Plant Modifications consisting of the following major components as defined in the System Improvements Study:

- a. Hydraulic Improvements, including raw water supplement and settled water supplement.
- b. Chemical Feed Improvements.
- c. Electrical System Improvements.
- d. Filter Modifications.

II. System Improvements consisting of the following major components as defined in the System Improvements Study:

- a. Added pumping capacity at Wills Pumping Station.
- b. Brandywine Filter Modifications.
- c. Brandywine Pump Modifications.

3. Said facilities shall be the same, except for changes necessary as required by prudent engineering design, as set forth in the preliminary study headed "System Improvements Required to Allow Transfer of 10 MGD to Wilmington Suburban Water Company" prepared for the City by Whitman Requardt and Associates dated May 16, 1988, consisting of seven (7) pages and one (1) table, and as updated by a one (1) page letter and one (1) cost estimate from Whitman Requardt and Associates dated September 19, 1989, (the "Systems Improvements Study" attached hereto and incorporated herein). The cost of the City facilities are estimated to be as shown in the 9/89 update of the cost estimate attached to such letter of September 19, 1989, attached hereto and incorporated herein, except that the estimated cost of chemical feed improvements shall be reduced from \$947,000 to \$474,000 and the estimated cost of Brandywine Pump #6 modification shall be reduced from \$580,000 to \$290,000 for purposes of calculating the Company's obligation to

make payments under paragraph 6 below. Therefore, the Company shall be obligated to pay the City an estimated \$2.637 Million as finally determined by actual construction costs, plus, the engineering fee referred to in Paragraph 1a., above, plus the interest carrying costs referred to in Paragraph 6, below.

4. All City facilities constructed under this Agreement shall be and, at all times, remain the property of City. The City shall be responsible at the expense of the City to maintain, repair and operate the City facilities commencing upon completion of construction and acceptance thereof by the City.

Financing.

5. The City agrees to finance the capital improvements needed to construct the City's facilities as detailed in Paragraph 2 above.

6. The City agrees to track the construction costs related to the facilities and to accrue interest carrying costs related to said construction at the interest rate used to determine the facilities availability charge. The total engineering fee, construction costs and interest carrying costs shall hereinafter be referred to as "WSWC Project Cost". Except as provided below, from the point in time when the City facilities are available to provide service to the Company (provided that the City has given Company six months'

notice of said availability date) through the 30 year initial term of this Agreement, Company agrees to pay to the City a facilities availability charge calculated to equal the annual debt service payments which would be needed to fully amortize over 30 years an issue of debt equal to the WSWC Project Cost. When the City issues its 1992 General Obligation Bonds, the interest rate will be determined by the underwriter of the City's issue, which will provide, in writing, to the City and Company an estimate of the average interest rate which the City's bonds would have carried had the issue been for a term of 30 years, with a schedule of serial bond maturities similar to the City's bond issue, but over a 30 year term. However, if the average interest rate quoted by the underwriter of the City's issue for a similar 30 year issue is more than .2% higher than the average interest rate for the City's 1992 20-year General Obligation Bond issue, then Company shall have the option to pay the facilities availability charge over a 20 year period using the City's actual average interest rate for the first 20 years of the initial 30 year term of the Agreement, and for the remaining 10 years of the initial 30 year term, Company will be obligated to make payments to the City only for the cost of purchased water. An example is attached hereto as Exhibit I.

7. The Company agrees to construct and maintain, at its sole expense, a 24 inch transmission main from the City's Porter Water Treatment Plant to the Company's Edgemoor Reservoir, including a meter pit near, or at, the interconnection to the Porter Water Treatment Plant, and any necessary easements and rights-of-way.

Such main and meter pit shall be and, at all times, remain the property of the Company. The City agrees that the Company can select a consulting engineer to design, prepare plans and specifications, and to inspect construction of such transmission main and meter pit. The Company agrees that the Committee can review and approve the plans and specifications for the transmission main.

Sale and Purchase of Treated Water

8. The City agrees to provide treated water in quantities as requested by the Company, but not to exceed a maximum of ten million gallons per day (10 MGD), with the maximum instantaneous rate not to exceed seven thousand seven hundred gallons per minute (7700 GPM). The Company agrees to pay the City for water purchased on a monthly basis, utilizing that rate per thousand gallons of water supplied which is equal to 70% of the industrial in-City customer usage rate. (At the present time the industrial in-City customer rate is \$1.15/1000 gallons). The rate payable by the Company is subject to adjustment from time to time whenever the City amends its water usage charges for industrial in-City customers, provided that the percent increase of such adjustments shall be consistent with the adjustments to the rate for industrial in-City customers.

9. The City will employ its best efforts to deliver the quantities of water provided for in this Agreement. However, in the event of

an emergency situation, as further described herein, the City may, without penalty, reduce or restrict partially or fully the quantity of water delivered through this interconnection.

For the purpose of this provision, an emergency situation shall consist of any circumstance or combination of circumstances which would prevent the City from delivering the agreed amount of water. Such circumstances include, but shall not be limited to:

- a. Raw water quality or quantity,
- b. Production plant or delivery system failure,
- c. Scheduled or emergency repairs, and
- d. Regulatory restriction decrees.

Scheduled maintenance or repairs shall commence only after written notice of such repairs from the City to the Company. Service may be discontinued as a result of emergency situations (except scheduled maintenance) upon verbal notice to the Company followed by written notice, as promptly as is practical.

Except in emergency situations solely impacting on this interconnection, all water utility customers shall be treated equally with respect to water restrictions resulting from emergency situations.

The City reserves the right to reduce or restrict partially or fully the delivery of treated water to the Company in the event that any two of the existing flocculation tanks must be removed from service due to emergency repair or maintenance. The City must reserve a minimum average rate of 22 MGD during the summer for the City's other customers. (The 22 MGD represents current usage prior

to any future improvements.)

10. City agrees that the quality of water delivered shall at all times meet the standards specified by the Delaware State Board of Health, the Safe Drinking Water Act and other applicable quality standards.

11. City shall provide and cause to be installed in the meter pit near the interconnection a suitable meter with continuous telemetered recording totaling device approved by the Company to accurately measure and to record all water transferred. Said meter shall be tested at least annually by City with results thereof to be provided to Company. Company reserves the right to test or have said meter tested at any time. The cost of meter tests performed by the Company at its request or option, other than the annual tests, shall be paid for by the Company. If said meter shall be found to be in error by more than allowable AWWA standards, the current and two preceding billings, if appropriate, shall be adjusted to compensate for the meter error.

12. Any rules or regulations adopted by the DRBC and/or the DNREC shall be deemed to be a part of this Agreement. In the event that any regulatory agency imposes conditions or additional requirements on the City or the Company which would materially and adversely affect the ability of either party to perform the covenants contained herein, or which would have a material adverse impact on the operation of either party, or which would render this Agreement

unprofitable or otherwise unfeasible to perform, the parties hereto shall enter into and conduct, in good faith, negotiations to alter the terms of this Agreement to make them acceptable to both parties.

General

13. The Company agrees to indemnify and save harmless City from any and all fees and charges arising out of this Agreement and imposed by Delaware Department of Natural Resources and Environmental Control, or any other Federal, State or local authority pursuant to any and all applicable Federal, State or local statutes, ordinances and regulations other than those City statutes, ordinances and regulations which would amend or restrict this Agreement.

14. This Agreement is subject to approval of the Delaware Public Service Commission (hereinafter "PSC") and will not be considered as binding until such time as final PSC approval has been received. Furthermore, this Agreement is subject to all applicable Federal, State, or City statutes, ordinances, and regulations.

Assignments

15. This Agreement shall be binding upon and inure to the benefit of the successors and assigns of the parties hereto. Neither party shall assign this Agreement without prior written approval of the

other; provided, however, that if the business of the Company is taken over by a successor company and the City is given prompt written notice, an assignment to such successor shall not be construed to violate this paragraph.

Force Majeure

16. Both parties hereto agree that they will make no claim against each other for damages as a result of actions taken under this Agreement either in the event that the City should be prevented from acting by reason of acts of God, conditions beyond its control, or as a result of making necessary repairs, alterations or additions, or in the event that the Company is prevented from acting by reason of acts of God or other conditions beyond its control. In such event, however, the affected party shall act expeditiously and judiciously to restore its ability to fulfill its obligations under this Agreement. In no way, however, shall this Paragraph relieve the Company of its obligation to make payments in accordance with Paragraph 6.

Term

17. The term of this Agreement shall commence on the date when all regulatory approvals are received and continue until the final payment is made in accordance with Paragraph 6. After the initial term of this Agreement, it will continue from year to year thereafter unless either party gives written notice to the other

party of its intent to terminate this Agreement at least two and one-half (2 1/2) years prior to the termination date, provided, however, that this Agreement shall not be terminable during its initial term. After the initial term of this Agreement, the Company's responsibility for payments in accordance with Paragraph 6 shall terminate and the Company will be responsible solely for purchasing water in accordance with Paragraph 8.

18. The Company hereby agrees to indemnify and hold the City harmless from any and all liability for damages or injuries (including death) to any person or property whatsoever arising from or occasioned by the pressure, volume, quantity, or quality of the water provided or intended to be provided hereunder or the construction, maintenance, or operation of the facilities which are the subject of this Agreement.

19. City and Company agree that this Agreement shall be construed in accordance with the statutory and case law of the State of Delaware, which is effective at the date of execution of this Agreement.

IN WITNESS WHEREOF, the City has caused these presents to be signed in its Corporate name by its Mayor, and its Corporate Seal duly

attested by City Clerk to be hereunto affixed; and the Company has caused these presents to be signed by its Vice President, and its Corporate Seal duly attested by its Assistant Secretary to be hereunto affixed, all as of the day and year first above written.

CITY OF WILMINGTON

Approved as to form
Mark J. P. Smith
Asst. City Solicitor

By

Harold B. Hawley
Mayor

Attest

Leo P. Marshall
City Clerk

WILMINGTON SUBURBAN WATER CORPORATION

By

William C. Linam
William C. Linam, President

Attest

Harold P. Holmes
Assistant Secretary

Exhibit 4

**Exhibit 4
United Water Delaware/Chester
Water Authority Post Road
Interconnection Flow Records**

UWDE/CWA Post Road Interconnection

COPY

Month	AveragePerDay WhenConnectionOpen
Jan-03	no data
Feb-03	221,625
Mar-03	155,625
Apr-03	245,474
May-03	298,556
Jun-03	316,467
Jul-03	280,000
Aug-03	351,857
Sep-03	343,333
Oct-03	no data
Nov-03	246,529
Dec-03	no data
Jan-04	242,222
Feb-04	no data
Mar-04	281,200
Apr-04	226,900
May-04	no data
Jun-04	387,143
Jul-04	397,857
Aug-04	no data
Sep-04	383,333
Oct-04	345,313
Nov-04	293,000
Dec-04	216,875
Jan-05	294,286
Feb-05	262,500
Mar-05	289,688
Apr-05	258,000
May-05	371,667
Jun-05	370,833
Jul-05	398,000
Aug-05	no data
Sep-05	282,500
Oct-05	346,000
Nov-05	342,857
Dec-05	294,286
Jan-06	245,000
Feb-06	256,667
Mar-06	263,333
Apr-06	308,571

OverallAverage 297,500

Exhibit 5

**Exhibit 5
Agreement between Chester
Water Authority and United Water
Delaware – Purchase Water
Interconnection**

AMENDMENT TO AGREEMENT BETWEEN
CHESTER WATER AUTHORITY AND
WILMINGTON SUBURBAN WATER CORPORATION

COPY

THIS AGREEMENT, made this *16th* day of *March* 1976, by and between CHESTER WATER AUTHORITY, a Municipal Corporation, of the City of Chester, Delaware County, Pennsylvania, hereinafter called the "AUTHORITY" and WILMINGTON SUBURBAN WATER CORPORATION, hereinafter called "CORPORATION".

W I T N E S S E T H :

WHEREAS, the parties hereto entered into an agreement under date of February 16, 1971 for the sale of water to "Corporation" by the "Authority"; and

WHEREAS, the parties hereto desire to amend the said agreement by deleting therefrom in its entirety paragraph 1 of the said agreement and substituting therefor a new paragraph 1, as hereinafter set forth.

NOW, THEREFORE, this agreement witnesseth, that the parties hereto, for and in consideration of the premises, and each intending to be legally bound hereby, consent and agree with each other as follows:

1. Paragraph 1 of the agreement between the parties dated February 16, 1971, is hereby deleted therefrom in its entirety.

2. In place of the said paragraph 1 in the said agreement, the parties hereto agree that there shall be substituted therefor in the said agreement of February 16, 1971, the following new paragraph 1, reading as follows:

"1. Effective November 1, 1975, all water withdrawn

pursuant hereto shall be billed monthly by the "Authority" and shall be paid by the "Corporation", in accordance with the then current rules, rates and regulations of the "Authority" as the same shall be from time to time, provided, however, that the "Corporation" shall pay for a minimum of 135,000 gallons per day, as if it had withdrawn water at the rate of 135,000 gallons for each day of each month during the term hereof.

3. All other provisions of the said agreement of February 16, 1971, except as herein specifically modified, shall remain in full force and effect.

IN WITNESS WHEREOF, Chester Water Authority and Wilmington Suburban Water Corporation have caused this agreement to be executed and delivered and their corporate seals affixed thereto the day and year first above written.

CHESTER WATER AUTHORITY

BY

[Signature]
Chairman

(Corporate Seal)

Executive Manager & Chief Engineer

Attest

[Signature]
Secretary

WILMINGTON SUBURBAN WATER CORPORATION

BY

[Signature]
Chairman V.P.

(Corporate Seal)

Attest

[Signature]
Asst. Secretary

AGREEMENT entered into by and between CHESTER WATER AUTHORITY (hereinafter called the "Authority")

A N D

WILMINGTON SUBURBAN WATER CORPORATION (hereinafter called the "Corporation").

WHEREAS, pursuant to the terms of a written agreement entered into between the Authority and the Corporation under date of August 20, 1964, amending a prior agreement dated February 1, 1962, the Corporation is presently withdrawing water from the Authority's distribution system at a point on the South side of Post Road (U.S. Route 13), approximately one hundred feet East of the Pennsylvania-Delaware State Line, although the term of said agreement expired on July 15, 1969; and

WHEREAS, it is the desire and intention of the parties to reduce their present agreement and understanding as of July 15, 1969;

NOW, THEREFORE, THIS AGREEMENT WITNESSETH That, for and in consideration of the mutual promises hereinafter contained, and intending to be legally bound hereby, the parties hereto respectfully covenant and agree as follows:

1. Retroactively to July 15, 1969, for all water withdrawn pursuant hereto the Authority shall bill the Corporation monthly at rates equivalent to 150 per cent of the Authority's regular tariff rates then currently in effect;

and that, even though a lesser quantity of water be actually withdrawn by it through the aforementioned connection during any month, the Corporation agrees to pay the Authority, at a minimum, as if it had withdrawn water at the rate of 135,000 gallons during each day of the said month.

2. The Authority agrees that it will give the Corporation at least two months' written notice of any proposed change of rates to the time when any such change is to become effective.

3. The obligation of the Authority to make water available to the Corporation under the terms of this agreement is mutually understood and agreed to be subject to the condition that the Authority shall use merely reasonable care and diligence to prevent interruptions and fluctuations in service. The Authority does not represent or warrant, however, that such interruptions or fluctuations in service will not occur by reason of breaks, leaks, required repairs to its facilities, strikes, Acts of God, drought conditions, or other causes beyond its control. Under any such condition, if the Authority's ability to satisfy current consumer demands within its regular service area is jeopardized, the quantities of water herein specified shall not be available to the Corporation.

4. This agreement shall remain in effect for a period of five years from and after July 15, 1969, but may be terminated

by either party at any time provided written notice of intention so to terminate shall have been given by such party to the other at least twelve months prior to the proposed termination. If not so terminated on or before July 15, 1974, the term of this agreement shall be extended for a further period of one year, and so on from year to year, until and unless terminated by either party by given at least said twelve months notice prior to the proposed termination.

5. All terms and conditions of the aforementioned agreements of February 1, 1962, and August 20, 1964, not modified or amended hereby shall remain in full force and effect.

IN WITNESS WHEREOF, the parties hereto have caused their corporate seals to be hereunto affixed, duly attested by their respective officers, this 16th day of February, 1971.

CHESTER WATER AUTHORITY

BY

ATTEST:

WILMINGTON SUBURBAN WATER
CORPORATION

BY

ATTEST

AGREEMENT entered into by and between CHESTER WATER
AUTHORITY (hereinafter called the "Authority")

A N D

WILMINGTON SUBURBAN WATER CORPORATION (hereinafter
called the "Corporation").

WHEREAS, pursuant to the terms of a written agreement entered into between the Authority and the Corporation under date of August 20, 1964, amending a prior agreement dated February 1, 1962, the Corporation is presently withdrawing water from the Authority's distribution system at a point on the South side of Post Road (U.S. Route 13), approximately one hundred feet East of the Pennsylvania-Delaware State Line, although the term of said agreement expired on July 15, 1969; and

WHEREAS, it is the desire and intention of the parties to reduce their present agreement and understanding as of July 15, 1969;

NOW, THEREFORE, THIS AGREEMENT WITNESSETH That, for and in consideration of the mutual promises hereinafter contained, and intending to be legally bound hereby, the parties hereto respectfully covenant and agree as follows:

1. Retroactively to July 15, 1969, for all water withdrawn pursuant hereto the Authority shall bill the Corporation monthly at rates equivalent to 150 per cent of the Authority's regular tariff rates then currently in effect;

and that, even though a lesser quantity of water be actually withdrawn by it through the aforementioned connection during any month, the Corporation agrees to pay the Authority, at a minimum, as if it had withdrawn water at the rate of 135,000 gallons during each day of the said month.

2. The Authority agrees that it will give the Corporation at least two months' written notice of any proposed change of rates to the time when any such change is to become effective.

3. The obligation of the Authority to make water available to the Corporation under the terms of this agreement is mutually understood and agreed to be subject to the condition that the Authority shall use merely reasonable care and diligence to prevent interruptions and fluctuations in service. The Authority does not represent or warrant, however, that such interruptions or fluctuations in service will not occur by reason of breaks, leaks, required repairs to its facilities, strikes, Acts of God, drought conditions, or other causes beyond its control. Under any such condition, if the Authority's ability to satisfy current consumer demands within its regular service area is jeopardized, the quantities of water herein specified shall not be available to the Corporation.

4. This agreement shall remain in effect for a period of five years from and after July 15, 1969, but may be terminated

by either party at any time provided written notice of intention so to terminate shall have been given by such party to the other at least twelve months prior to the proposed termination. If not so terminated on or before July 15, 1974, the term of this agreement shall be extended for a further period of one year, and so on from year to year, until and unless terminated by either party by given at least said twelve months notice prior to the proposed termination.

5. All terms and conditions of the aforementioned agreements of February 1, 1962, and August 20, 1964, not modified or amended hereby shall remain in full force and effect.

IN WITNESS WHEREOF, the parties hereto have caused their corporate seals to be hereunto affixed, duly attested by their respective officers, this 16th day of February, 1971.

CHESTER WATER AUTHORITY

BY [Signature]

ATTEST: [Signature]

WILMINGTON SUBURBAN WATER
CORPORATION

BY [Signature]

ATTEST [Signature]

AGREEMENT entered into by and between CHESTER MUNICIPAL AUTHORITY (hereinafter called the "Authority")

A N D

WILMINGTON SUBURBAN WATER CORPORATION (hereinafter called the "Corporation").

WHEREAS, pursuant to the terms of a written agreement entered into between the Authority and the Corporation under date of February 1, 1962, the Corporation is presently withdrawing water from the Authority's distribution system at a point on the South side of Post Road (U.S. Route 13), approximately one hundred feet East of the Pennsylvania - Delaware State Line; and

WHEREAS, it is the desire and intention of the parties to amend the above-mentioned agreement retroactively as of July 15, 1964, in the particulars hereinafter set forth;

NOW, THEREFORE, THIS AGREEMENT WITNESSETH That, for and in consideration of the mutual promises hereinafter contained, and intending to be legally bound hereby, the parties hereto respectfully covenant and agree as follows:

1. The above-mentioned agreement of February 1, 1962, is hereby amended to provide that, retroactively to July 15, 1964, for all water withdrawn pursuant hereto the Authority shall bill the Corporation monthly at rates equivalent to 150 per cent of the Authority's regular tariff rates then currently in effect; and that, even though a lesser quantity of water be actually withdrawn by it through the aforementioned connection during any month, the

Corporation agrees to pay the Authority, at a minimum, as if it had withdrawn water at the rate of 135,000 gallons during each day of the said month.

2. The Authority agrees that it will give the Corporation at least two months' written notice of any proposed change of rates prior to the time when any such change is to become effective.

3. The obligation of the Authority to make water available to the Corporation under the terms of this agreement is mutually understood and agreed to be subject to the condition that the Authority shall use merely reasonable care and diligence to prevent interruptions and fluctuations in service. The Authority does not represent or warrant, however, that such interruptions or fluctuations in service will not occur by reason of breaks, leaks, required repairs to its facilities, strikes, Acts of God, drought conditions, or other causes beyond its control. Under any such condition, if the Authority's ability to satisfy current consumer demands within its regular service area is jeopardized, the quantities of water herein specified shall not be available to the Corporation.

4. This agreement shall remain in effect for a period of five years from and after July 15, 1964, but may be terminated by either party at any time provided written notice of intention so to terminate shall have been given by such party to the other at least twelve months prior to the proposed termination.

5. All terms and conditions of the aforementioned agreement of February 1, 1962, not modified or amended hereby shall remain in full force and effect.

IN WITNESS WHEREOF, the parties hereto have caused their corporate seals to be hereunto affixed, duly attested by their respective officers, this 28th day of AUGUST, A.D. 1964.

CHESTER MUNICIPAL AUTHORITY

By: Arthur R. [Signature] Vice-Chairman

Attest: Robert J. Murphy
Sec.

WILMINGTON SUBURBAN WATER CORP.

By: [Signature]

Attest: George B. Hegarty, Jr.

AGREEMENT entered into this *1st* day of *February*
A.D. 1962, by and between CHESTER MUNICIPAL AUTHORITY, Party of
the First Part (hereinafter called the "Authority"),

A N D

WILMINGTON SUBURBAN WATER CORPORATION, Party of the Second Part
(hereinafter called the "Corporation").

WHEREAS, the Corporation is engaged in supplying water
to consumers in the State of Delaware; and

WHEREAS, the Corporation is desirous of obtaining from
the Authority a limited quantity of water for distribution to its
own consumers in its said territory; and

WHEREAS, upon the conditions hereinafter set forth, the
Authority is willing to make available to the Corporation, for a
limited period, a quantity of water for use as aforesaid;

NOW, THEREFORE, THIS AGREEMENT WITNESSETH, That for and
in consideration of the premises and of the sum of One Dollar
(\$1.00) each to the other in hand paid, the receipt whereof is
mutually acknowledged, and intending to be legally bound hereby,
the parties hereto covenant and agree as follows:

1. The Authority will tap its 12-inch transmission line
located at the south side of Post Road (U.S. Route 13), approxi-
mately 100 feet east of the Pennsylvania-Delaware state line, so
that a connection may be made from the said line to a meter-pit
located as shown on a sketch attached hereto and made part hereof;
and the Corporation will promptly reimburse the Authority for any

and all expenses incurred by the Authority in this connection.

2. The Corporation, at its sole cost and expense, will construct the above-mentioned meter-pit in accordance with the Authority's specifications and subject to the Authority's inspection, at the location shown on the above-mentioned sketch, and will connect its own pipe-line to a meter to be placed by the Authority in the said pit.

3. The Authority, at its sole cost and expense, will supply and install a 6-inch compound meter in the said meter-pit; and upon completion of such work, the entire installation, including the meter-pit, shall become and remain the exclusive property of the Authority.

4. If at any time during the term of this Agreement the Authority shall so request, the Corporation, at its sole cost and expense, will supply a recording device satisfactory to the Authority for use in conjunction with the said meter, and said recording device shall thereupon likewise become and remain the exclusive property of the Authority.

5. Through the facilities hereinabove described, the Authority shall make available to the Corporation water from the Authority's distribution system, but the rate of withdrawal of such water by the Corporation shall not exceed 350 gallons per minute, except where a higher rate of withdrawal may be required for the purpose of fighting a fire or conducting a fire-test; in which event, the maximum withdrawal rate shall be 1300 gallons per minute, but only for the duration of the fire or the test, as the case may be. However, a fire-test may be conducted only at such time or times as the Authority may approve, following

written request received from the Corporation not less than forty-eight hours prior to the time it may desire to conduct such test.

6. The Corporation shall be billed monthly in accordance with the Authority's rules, rates and regular tariff then currently in effect for all water taken by the Corporation through the connection hereby contemplated; but, whether taken or not, the Corporation agrees to pay each month, at a minimum, as if it had actually withdrawn water at the rate of 360,000 gallons during each day of the said month.

7. The obligation of the Authority to make available to the Corporation the said supply of water is expressly limited by the understanding that the Authority shall undertake to use merely reasonable care and diligence to prevent interruptions and fluctuations in its service. The Authority does not represent or warrant that such interruptions and fluctuations in service will not occur, or that because of breaks, leaks, required repairs to its facilities, strikes, Acts of God or other causes beyond its control, there may not be periods during which water will not be available for withdrawal by the Corporation at the maximum rates above mentioned, or at any other rate, or at any pressure or in any aggregate quantity.

8. This agreement shall become effective on January 1, 1962 and expire on December 31, 1966, but billings hereunder shall not be made until such time as the Corporation shall have started to withdraw water through the above-mentioned connection; and such withdrawal shall not be commenced until the Authority shall have received forty-eight hours advance notice of the intention of the Corporation to activate the service.

9. It is expressly understood and agreed that this agreement may be terminated at any time after December 31, 1963, provided written notice of an intention to terminate shall have been given by either party to the other at least one full year prior to such proposed termination.

10. This agreement shall be binding upon the respective successors and assigns of the parties hereto, and the benefits hereof shall enure to the same.

IN WITNESS WHEREOF, the parties hereto have caused their corporate seals to be hereunto affixed, duly attested by their respective officers, the day and year first above mentioned.

CHESTER MUNICIPAL AUTHORITY

By:

L. J. Dougherty
VICE CHAIRMAN

Attest:

Dexter J. Murphy
SECRETARY

WILMINGTON SUBURBAN WATER CORPORATION

By:

Wesley C. Finner

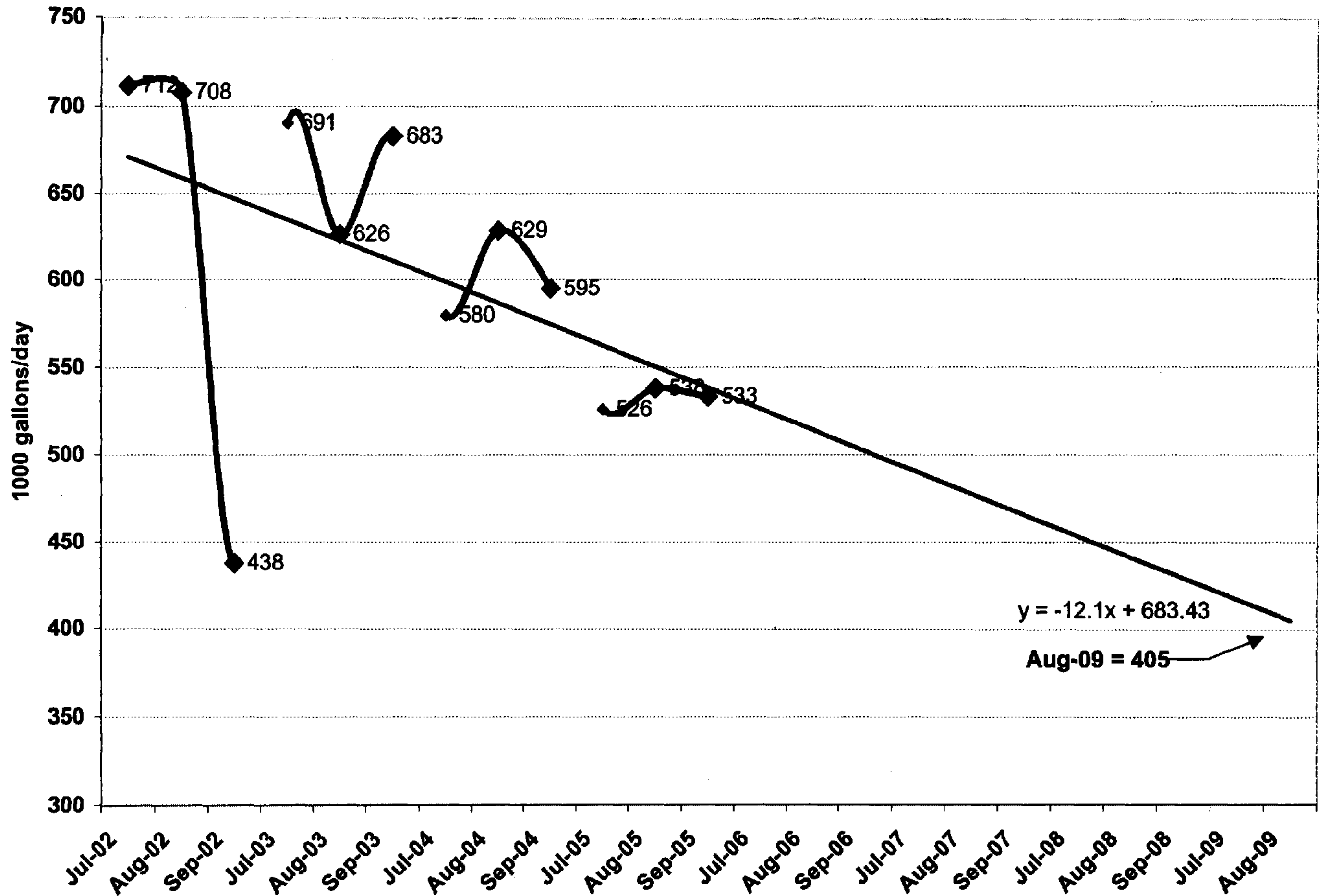
Attest:

George B. Fliegel, Jr.

Exhibit 6

**Exhibit 6
United Water Delaware/United
Water Bethel State Line
Interconnection Flow Records**

UWDE/UWBethel State Line Interconnection



COPY

Exhibit 7

**Exhibit 7
Agreement between United
Water Bethel and United Water
Delaware**

COPY

AGREEMENT made this 3rd day of June, A.D. 1981, by and between WILMINGTON SUBURBAN WATER CORPORATION (hereinafter "Wilmington"), a corporation organized and existing under the laws of the State of Delaware and maintaining a business office at 3219 Philadelphia Pike, Claymont, Delaware, 19703

AND

BETHEL TOWNSHIP WATER COMPANY (hereinafter "Bethel"), a corporation organized and existing under laws of the Commonwealth of Pennsylvania and maintaining a business office at 399 East Park Drive, Harrisburg, Pennsylvania, 17111;

WHEREAS, Wilmington owns and operates waterworks facilities and furnishes water service to the public in the State of Delaware and

WHEREAS, Bethel owns and operates waterworks facilities and furnishes water service to the public in portions of Delaware County, Pennsylvania, and

WHEREAS, Wilmington and Bethel desire to reduce to writing the terms and conditions of their unwritten agreement in existence since July 23, 1968, under which water is delivered through certain waterworks facilities consisting of two 6" meters, meter pit and 12" transmission main constructed by the parties and located near the intersection of U.S. Route 202 and the boundary line separating the State of Delaware and the Commonwealth of Pennsylvania;

NOW, THEREFORE, THIS AGREEMENT WITNESSETH that Wilmington and Bethel, for and in consideration of the promises set forth herein and intending to be legally bound hereby, covenant and agree as follows:

1. Bethel agrees to sell water to Wilmington, and Wilmington agrees to purchase water from Bethel, at the metering point described above, in amounts as specified in paragraph three. In the event that water is needed in emergency by Bethel to meet its service obligation, Wilmington agrees to make its best effort to provide water, if available, and Bethel agrees to purchase water at said metering point in an amount sufficient to enable Bethel to meet its service obligation. The charge for such sales of water shall be in accordance with the appropriate party's rules, regulations and normal tariff rates then currently in effect. The parties agree to give notice of any proposed change in rates or regulations that would affect this agreement, in accordance with their respective regulatory requirements.

2. Bills shall be rendered monthly by the parties for all water delivered by either at the metering point described above.

3. Wilmington agrees to purchase, and Bethel agrees to provide, an amount of water sufficient to guarantee the minimum purchase of water by Bethel from Chester Water Authority (Authority), under a contract between Bethel and the Authority dated May 10, 1968, as amended. The maximum amount of water to be provided by Bethel under this agreement is 1.5 million gallons per day.

4. Bethel and Wilmington acknowledge that there will be occasions when, because of failure of facilities, leaks, required repairs to facilities, strikes, acts of God or other temporary, emergency circumstances, beyond the control of the parties, interruptions or fluctuations in service will occur, and the parties agree that, during the period of such interruptions or fluctuations the obligations of the parties under this agreement shall be suspended, provided as to Bethel's obligations hereunder, that Bethel's obligations under its contract

with the Authority are also suspended.

5. The term of this agreement shall be the same as the term of the Agreement for supply of water between Bethel and the Authority dated May 10, 1968 and effective July 23, 1968, as amended, or any such term to which Bethel and the Authority may subsequently agree, or as may be fixed by extension or by notice of termination as set forth under said Agreement, dated May 10, 1968. Any notice of Termination sent or received by Bethel under said Agreement with the Authority shall be forwarded to Wilmington.

IN WITNESS WHEREOF, Wilmington Suburban Water Corporation and Bethel Township Water Company have caused this agreement to be executed and their corporate seals to be affixed hereto the day and year stated above.

WILMINGTON SUBURBAN WATER CORPORATION

By: 

L.M. Perkins
Vice President

Attest: 

Secretary

(SEAL)

BETHEL TOWNSHIP WATER COMPANY

By: 

George B. Plegal, Jr.
Vice President

Attest: 

Secretary

(SEAL)

STATE OF PENNSYLVANIA)
COUNTY OF DELAWARE)

SS:

On this, the 3rd day of June, 1981,
before me, the undersigned officer, a Notary Public, personally appeared
GEORGE B. FLEGAL, JR., who acknowledged himself to be Vice President of
BETHEL TOWNSHIP WATER COMPANY, a corporation, and that he, as such officer,
being authorized to do so, executed the foregoing instrument, for purposes
therein contained, by signing the name of such corporation, by himself as
such officer.

IN WITNESS WHEREOF, I set my hand and official seal.

Geraldine Marie Meehan
Notary Public

GERALDINE MARIE MEEHAN
Notary Public, Bryn Mawr, Delaware Co.
My Commission Expires March 11, 1985

(SEAL)

Exhibit 8

**Exhibit 8
Agreement between Chester
Water Authority and United
Water Bethel**

COPY

AMENDMENT TO AGREEMENT BETWEEN
CHESTER WATER AUTHORITY AND
BETHEL TOWNSHIP WATER COMPANY

THIS AGREEMENT made this *14th* day of *March*
1976, by and between CHESTER WATER AUTHORITY, a Municipal
Authority of the City of Chester, Delaware County, Pennsylvania,
hereinafter called the "AUTHORITY" and BETHEL TOWNSHIP WATER
COMPANY, a Corporation of the Commonwealth of Pennsylvania,
maintaining its principal office at 13 Wright Street, Parkesburg,
Pennsylvania, hereinafter called "BETHEL".

W I T N E S S E T H :

WHEREAS the parties hereto entered into an agreement
under date of May 10, 1968 for the sale of water to "Bethel"
by the "Authority"; and

WHEREAS, the parties hereto desire to amend the said
agreement by deleting therefrom in its entirety paragraph 4 of
the said agreement and substituting therefor a new paragraph
4 as hereinafter set forth.

NOW, THEREFORE, this agreement witnesseth, that the
parties hereto, for and in consideration of the premises, and
each intending to be legally bound hereby, consent and agree
with each other as follows:

1. Paragraph 4 of the agreement between the parties,
dated May 10, 1968, is hereby deleted therefrom in its entirety.
2. In place of the said paragraph 4 in the said

shall be substituted therefor in the said agreement of May 10, 1968, the following new paragraph 4, reading as follows:

"4. The Authority agrees to sell water to "Bethel" and "Bethel" agrees to purchase water from the "Authority", at the metering point described in paragraph No. 2, above. The charge, less any discount of the "Authority" for such sale of water to "Bethel" shall be in accordance with the "Authority's" rates, regulations and tariffs as the same shall be from time to time. The "Authority" agrees to give "Bethel" at least three (3) months advance written notice of any proposed change in rates or regulations which would affect "Bethel" before any such change shall become effective.

Bethel shall be billed monthly by the Authority for all water delivered by the Authority through the meter to which reference is made in paragraph No. 3, above. The first bill shall be rendered by the Authority for water delivered during the first month after the date when "Bethel's" waterworks facilities shall have been connected to a meter as provided in paragraph No. 3, above; provided, however, that if "Bethel" shall not have constructed the meter pit and connected its waterworks facilities to a meter immediately after the "Authority" shall have completed construction of the transmission main to which reference is made in paragraph No. 1, above, and if the "Authority", otherwise, would be ready to deliver water to "Bethel", the "Authority" shall have the right to impose thereafter the minimum charge provided in this paragraph No. 4,

if "Bethel" shall have requested the "Authority" by prior notice, to construct said transmission main.

Bethel agrees to purchase a minimum of 1,000,000 gallons of water per day at the metering point to which reference is made in paragraph No. 3, above; and, subject to provisions of paragraph No. 6, below, the Authority agrees to deliver a maximum of 1,500,000 gallons of water per day at said metering point. Subject to provisions of paragraph No. 6, below, if the volume of water purchased by "Bethel" at said metering point does not equal a minimum of 1,000,000 gallons of water per day, as averaged during the then current month, "Bethel" agrees to pay to the "Authority" an amount equal to the charge which would have been imposed by the "Authority" if the volume delivered during such month had averaged 1,000,000 gallons of water per day.

Bethel agrees that the "Authority" shall not be obligated to make available to "Bethel" at the said metering point more than 1,500,000 gallons of water per day unless and until the "Authority" and "Bethel" have modified this agreement in writing to provide otherwise."

3. All other provisions of the said agreement of May 10, 1968, except as herein specifically modified, shall remain in full force and effect.

IN WITNESS WHEREOF, Chester Water Authority and Bethel Township Water Company have caused this agreement to be executed and delivered and their corporate seals affixed hereto, the day

and year first above written.

CHESTER WATER AUTHORITY

BY:

W. K. MacEwan
Chairman (Corporate Seal)

Executive Manager and Chief Engineer

ATTEST:

Anthony P. Pyle
Secretary

BETHEL TOWNSHIP WATER COMPANY

BY

L. M. Rubin
President (Corporate Seal)

ATTEST

H. A. Buck Jr.
Asst Secretary

COPY

AGREEMENT made this 10th day of May, A. D. 1968,

by and between CHESTER WATER AUTHORITY, a municipal authority organized and existing under laws of the Commonwealth of Pennsylvania and maintaining its principal office at Chester, Pennsylvania (hereinafter called the "Authority"),

A N D

BETHEL TOWNSHIP WATER COMPANY, a corporation organized and existing under laws of the Commonwealth of Pennsylvania and maintaining its principal office at 13 Wright Street, Parkesburg, Pennsylvania (hereinafter called "Bethel").

WHEREAS, the Authority owns and operates waterworks facilities and furnishes water service to the public within Delaware County, Pennsylvania; and

WHEREAS, Bethel proposes to furnish water service to the public within portions of townships of Bethel and Concord, Delaware County, Pennsylvania, and presently has applications on file with the Pennsylvania Public Utility Commission in order to secure certificates of public convenience authorizing the furnishing of such service; and

WHEREAS, the Authority and Bethel desire to set forth the terms and conditions under which the Authority will sell water to Bethel.

NOW, THEREFORE, WITNESSETH That, the Authority and Bethel, for and in consideration of the promises set forth herein and intending to be legally bound hereby, covenant and agree as follows:

1. The Authority agrees to construct, within six months after written notice from Bethel to do so, a transmission main in townships of

Birmingham and Concord, Delaware County, Pennsylvania, in a southerly direction, from the Authority's existing 42-inch transmission main to the intersection of U. S. Highway Route No. 202 and Elam Road. Said transmission main of the Authority shall be constructed without contribution or advance from Bethel or any affiliate of Bethel.

2. The Authority agrees to tap the transmission main to be constructed, as provided in paragraph No. 1, above, so that a connection can be made from said transmission main to a meter pit to be constructed by Bethel at a point, near the intersection of U. S. Highway Route No. 202 and Elam Road, which shall be satisfactory to the Authority and Bethel. Bethel agrees to construct said meter pit, at its cost and expense, in accordance with specifications of the Authority and subject to the Authority's inspection, as soon as possible after Bethel shall have given written notice to the Authority to construct the transmission main.

3. The Authority agrees to supply and install, at its cost and expense, a meter in the meter pit to which reference is made in paragraph No. 2, above, and said meter shall remain the property of the Authority. Bethel agrees that, upon completion of such meter installation, the meter pit shall become and remain the exclusive property of the Authority. The Authority agrees that employees of Bethel shall have access to the meter pit.

Bethel agrees to connect its waterworks facilities to said meter immediately after installation of the meter by the Authority.

4. The Authority agrees to sell water to Bethel, and Bethel agrees to purchase water from the Authority, at the metering point described in paragraph No. 2, above. The charge, less any discount, of the Authority for

such sale of water to Bethel shall be in accordance with the Authority's rules and regulations and shall not be in excess of the charge, less any discount, of the Authority for sale of the same quantity of water to other public water supply agencies for resale to their customers. The Authority agrees to give Bethel at least three months' advance written notice of any proposed change in rates or regulations which would affect Bethel.

Bethel shall be billed monthly by the Authority for all water delivered by the Authority through the meter to which reference is made in paragraph No. 3, above. The first bill shall be rendered by the Authority for water delivered during the first month after the date when Bethel's waterworks facilities shall have been connected to a meter as provided in paragraph No. 3, above; provided, however, that, if Bethel shall not have constructed the meter pit and connected its waterworks facilities to a meter immediately after the Authority shall have completed construction of the transmission main to which reference is made in paragraph No. 1, above, and if the Authority, otherwise, would be ready to deliver water to Bethel, the Authority shall have the right to impose thereafter the minimum charge provided in this paragraph No. 4, if Bethel shall have requested the Authority, by prior notice, to construct said transmission main.

Bethel agrees to purchase a minimum of 1,000,000 gallons of water per day at the metering point to which reference is made in paragraph No. 3, above; and, subject to provisions of paragraph No. 6, below, the Authority agrees to deliver a maximum of 1,500,000 gallons of water per day at said metering point. Subject to provisions of paragraph No. 6, below, if the volume of water purchased by Bethel at said metering point does not equal a minimum of 1,000,000 gallons of water per day, as averaged during the then current month,

Bethel agrees to pay to the Authority an amount equal to the charge which would have been imposed by the Authority if the volume delivered during such month had averaged 1,000,000 gallons of water per day.

Bethel agrees that the Authority shall not be obligated to make available to Bethel at the said metering point more than 1,500,000 gallons of water per day unless and until the Authority and Bethel shall have modified this agreement to provide otherwise.

5. The Authority's obligation, herein, to sell to Bethel a maximum of 1,500,000 gallons of water per day shall reduce, to the extent of such maximum, during the term of this agreement, the right of Octoraro Water Company to demand that the Authority deliver 5,000,000 gallons of water per day to Octoraro Water Company under agreements dated December 31, 1946 and September 10, 1947, to which Octoraro Water Company is a party (such reduction, during the term of this agreement, being from 5,000,000 gallons of water per day to 3,500,000 gallons of water per day). In agreeing to furnish water to Bethel, the Authority is not to be understood to have conceded an obligation to do so under said agreements dated December 31, 1946 and September 10, 1947.

6. If, at any time, the Authority finds that it is necessary to curtail deliveries of water to customers located within its service area, the quantities of water to be delivered to Bethel, at the metering point to which reference is made in paragraph No. 3, above, may be reduced by the Authority; provided, however, that any curtailment of deliveries to Bethel shall be in the same proportion as, to the same extent as, and in common with, curtailments to all other customers of the Authority purchasing water from the Authority for resale to their customers. Bethel's obligation hereunder to purchase from the

Authority a minimum of 1,000,000 gallons of water per day, on average, shall be reduced proportionally for the period during which curtailment in the said specified volume shall have occurred for any reason whatsoever.

The Authority and Bethel acknowledge that there will be occasions when, because of failure of facilities, leaks, required repairs to facilities, strikes, acts of God or other temporary, emergency circumstances, beyond the control of the Authority, interruptions or fluctuations in service will occur, and Bethel and the Authority agree that, during the period of such interruptions or fluctuations, the minimum and maximum provisions of paragraph No. 4, above, shall be suspended.

7. The Authority agrees that Bethel may sell, to any affiliate of Bethel, water purchased by Bethel from the Authority.

8. The initial term of this agreement shall be for a period of ten years from the effective date provided by paragraph No. 10, below.

The initial term of this agreement may be extended, however, at the option of Bethel, for an additional period of five years by written notice delivered by Bethel to the Authority twelve months prior to expiration of the initial, ten-year term. Such extended term of this agreement may be extended, at the option of Bethel, for a second, additional period of five years by written notice delivered by Bethel to the Authority twelve months prior to expiration of the first, additional period of five years, if Bethel shall have exercised its right to extend the initial term of this agreement prior to expiration of the initial, ten-year term.

The term of this agreement shall be extended, without notice by

either party, on a year-to-year basis, if the term of this agreement shall not have been extended otherwise as provided above, or shall not have been sooner terminated in accordance with the provisions hereinafter set forth.

This agreement may be terminated by Bethel upon twelve months' written notice to the Authority; provided, however, that this agreement cannot be terminated by written notice from Bethel prior to expiration of the initial, ten-year term of this agreement or prior to expiration of an extension of the term of this agreement pursuant to an option exercised by Bethel, as provided above; although Bethel shall have the right to give such written notice earlier, to become effective upon the expiration of the initial, ten-year term of this agreement or upon expiration of an extension of the term of this agreement.

This agreement may be terminated by the Authority upon twelve months' written notice to Bethel; provided, however, that this agreement cannot be terminated by written notice from the Authority prior to expiration of the initial, ten-year term of this agreement; and provided also, however, that the Authority's right of termination shall be qualified and limited by, and subject to, Bethel's options to extend the initial term or an extended term of this agreement, as provided above, and that this agreement cannot be terminated by the Authority prior to expiration of any effective extension of the term of this agreement.

9. Notices shall be deemed to have been delivered when deposited in the United States mail, postage prepaid, addressed as follows:

(a) to the Authority:

Chester Water Authority
Chester, Pennsylvania

(b) to Bethel:

Bethel Township Water Company
c/o Wilmington Suburban Water
Corporation
3219 Philadelphia Pike
Claymont, Delaware

10. This agreement shall become effective on the date when the Pennsylvania Public Utility Commission, pursuant to and in accordance with the terms and conditions of a written stipulation to be entered into between the parties hereto, shall have issued certificates of public convenience authorizing Bethel to furnish water service to the public within portions of the townships of Bethel and Concord, Delaware County, Pennsylvania, and fixing the intersection of U. S. Highway Route No. 202 and Elam Road as part of the northern boundary of the territory to be served by Bethel in Township of Concord.

11. This agreement shall be binding upon, and the benefits thereof shall enure to, the Authority and Bethel and their respective successors and assigns.

IN WITNESS WHEREOF, Chester Water Authority and Bethel Township Water Company have caused this agreement to be executed and their corporate seals to be affixed hereto the day and year stated above.

CHESTER WATER AUTHORITY

(SEAL)

By:

Robert J. Mandy
VICE-CHAIRMAN

Attest:

Arthur J. [Signature]
SECRETARY

BETHEL TOWNSHIP WATER COMPANY

(SEAL)

By:

Barry C. [Signature]
Vice President

JOINDER IN AGREEMENT

Octoraro Water Company, a corporation organized and existing under laws of the Commonwealth of Pennsylvania and maintaining its principal office at 13 Wright Street, Parkesburg, Pennsylvania, an affiliate of Bethel Township Water Company, for and in consideration of Chester Water Authority's entering into the foregoing agreement with Bethel Township Water Company, and intending to be legally bound by this joinder in agreement, covenants and agrees to be bound by the provisions of paragraph No. 5 of the foregoing agreement, and joins in the foregoing agreement only for such limited purpose.

IN WITNESS WHEREOF, Octoraro Water Company has caused this joinder in agreement to be executed and its corporate seal to be affixed hereto this 18th day of May, A. D. 1968.

(SEAL)

OCTORARO WATER COMPANY

By: 

Vice President

Attest: 

ASSISTANT Secretary

STATE OF DELAWARE

COUNTY OF NEW CASTLE

)
) SS:
)

On this, the *24TH* day of *APRIL*, 1968, before me, the undersigned officer, a Notary Public, personally appeared VICTOR W. FAIVRE who acknowledged himself to be Vice President of BETHEL TOWNSHIP WATER COMPANY, a corporation, and that he, as such officer, being authorized to do so, executed the foregoing instrument, for purposes therein contained, by signing the name of such corporation, by himself as such officer.

I certify that I am not an officer or director of the above-mentioned corporation.

IN WITNESS WHEREOF, I set my hand and official seal.

H. Mearns Tenney Jr.

Notary Public

MY COMMISSION EXPIRES JUNE 7, 1969

I maintain my principal office at:

Wilmington Trust Company
Claymont Office *

(SEAL)

COMMONWEALTH OF PENNSYLVANIA)
) SS:
COUNTY OF DELAWARE)

On this, the 1st day of May, 1968, before me, the undersigned officer, a Notary Public, personally appeared

Peter J. Murphy who acknowledged himself to be Vice Chairman of CHESTER WATER AUTHORITY, a municipality authority, and that he, as such officer, being authorized to do so, executed the foregoing instrument, for purposes therein contained, by signing the name of such municipality authority, by himself as such officer.

IN WITNESS WHEREOF, I set my hand and official seal.

Regina M. Tracy
Notary Public

I maintain my principal office at:

(SEAL)

NOTARY PUBLIC
My Commission Expires July 23, 1970
CHESTER, DEL. CO., PENNA.

STATE OF DELAWARE

COUNTY OF NEW CASTLE

)
) SS:
)

On this, the 24TH day of APRIL, 1968, before me, the undersigned officer, a Notary Public, personally appeared VICTOR W. FAIVRE who acknowledged himself to be Vice President of OCTORARO WATER COMPANY, a corporation, and that he, as such officer, being authorized to do so, executed the foregoing instrument, for purposes therein contained, by signing the name of such corporation, by himself as such officer.

I certify that I am not an officer or director of the above-mentioned corporation.

IN WITNESS WHEREOF, I set my hand and official seal.

H. Meren Kessy J.
Notary Public

MY COMMISSION EXPIRES JUNE 7, 1969

I maintain my principal office at:

Wilmington Trust Company
Claymont Office

(SEAL)

Exhibit 9

**Exhibit 9
Stanton Water Treatment Plant
Allocation Permits (DNREC &
DRBC)**



COPY

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
& ENVIRONMENTAL CONTROL
DIVISION OF WATER RESOURCES
89 KINGS HIGHWAY, P.O. BOX 1401
DOVER, DELAWARE 19903

PUBLIC WATER ALLOCATION

ALLOCATION NO: 90-0013M
EFFECTIVE DATE: July 16, 1993
EXPIRATION DATE: July 16, 2023
MODIFICATION DATE: April 8, 1996

Pursuant to the provisions of 6010f, 7 Del. C., an allocation of water is hereby granted to:

UNITED WATER DELAWARE
2000 First State Blvd.
P. O. Box 6508
Wilmington, Delaware 19804

for the withdrawal and use of water from the following water facilities:

<u>Intake ID</u>	<u>Location</u>	<u>Stream</u>	<u>Latitude</u>	<u>Longitude</u>	<u>Maximum Pumping Capacity (gpm)</u>
#1	Pump House No. 1	White Clay Creek	39°42'23"	75°38'44"	14,000
#2	Pump House No. 2	White Clay Creek	39°42'24"	75°38'44"	7,000
#2a	Above Confluence	White Clay Creek	39°42'27"	75°38'47"	7,000

OTHER APPROVALS

1. This allocation shall be reviewed by the Division of Water Resources every five years from the date of this approval.
2. This approval is subject to all appropriate regulations and approvals of the Delaware River Basin Commission.
3. Approval for the use of this water for human consumption must be obtained from the Bureau of Environmental Health.
4. Approval for discharge of this water must be obtained from the Division of Water Resources.
5. This approval is subject to modification in accordance with establishment of State instream flow and passby requirements.

Delaware's good nature depends on you!

EQUIPMENT REQUIREMENTS

1. All intakes must be equipped with appropriate metering equipment in accordance with accepted engineering practice for recording pumping rates and cumulative volumes of withdrawal to a design accuracy of $\pm 5\%$.

REPORTING PROCEDURE

1. For each intake readings of pumping rates and cumulative volumes of withdrawal must be made and recorded at least daily. This and all other requested information, such as water purchases and sales, is to be recorded on forms provided by the Division of Water Resources and submitted by the permit holder to the Division annually by January 31, or more frequently if requested.

ALLOCATION

1. In any twenty-four (24) hour period withdrawals from these intakes shall not exceed 30,000,000 gallons.
2. In any thirty (30) day period withdrawals from these intakes shall not exceed 900,000,000 gallons.
3. In any twelve (12) month period withdrawals from these intakes shall not exceed 10,950,000,000 gallons.
4. Withdrawals for the facilities listed below shall not exceed the following limits:

<u>Intake #</u>	<u>Permit #</u>	<u>Maximum Capacity (gallons/day)</u>
#1	8005	20,000,000
	(below confluence with Red Clay Creek)	
#2	8233	10,000,000
	(below confluence with Red Clay Creek)	
#2a	8241	10,000,000
	(above confluence with Red Clay Creek)	

5. These intakes may be used only for the purpose of public supply. Any change in the intended use or in the physical characteristics of these facilities must receive prior approval from the Division of Water Resources.
6. All laws and regulations governing the construction, operation, maintenance, and repair water supply facilities in the State of Delaware shall be obeyed.
7. Representatives of the Division of Water Resources, Delaware Geological Survey and the U.S. Geological Survey may inspect these facilities, conduct any tests, and collect any samples at any time deemed necessary.
8. This allocation is specifically subject to the requirements of 7 Del. C. s6031.
9. If the withdrawal of water pursuant to this allocation has significant adverse affects including, but not limited to, reduction of streamflows, lowering of water levels, migration of pollutants, or encroachment of salt water, the Division of Water Resources may require action to rectify the problem.
10. This permit is transferable only if the requirements of the Regulations Governing the Allocation of Water are met and, approval is obtained from the Division of Water Resources.
11. Violations of conditions of this permit are subject to penalties provided in 7 Del. C., Chapter 60.

12. WATER CONSERVATION MEASURES

This approval is contingent on practice by the permit holder of reasonable and effective efforts to minimize the unnecessary use and/or waste of water. The permit holder must at minimum:

- A. Establish a program of periodic monitoring and evaluation of water usage,
- B. Establish a systematic leak detection and control program which is responsive to high unaccounted for water usage rates, routine maintenance, or discovery of leaks,
- C. Use the best practical methods and devices to conserve water,
- D. Alert employees and customers of the need to conserve water and reduce wasteful usage, including conservation suggestions in water bills, and

13. WATER CONSERVATION MEASURES (cont.)

E. Develop a contingency plan to be implemented in the event of water shortage emergencies. This plan should include:

1. Identification of emergency water sources,
2. Priorities of water usage, and
3. Emergency measures to curtail water usage.

14. CONJUNCTIVE USE OF WATER RESOURCES

This approval is contingent on practice by the permit holder to employ to the greatest practicable extent conjunctive use of available water supplies for purposes which include improving the reliability of those supplies, gaining long-term cost effectiveness in the operation of its water supply system, and minimizing potential adverse effects of withdrawals upon the environment.

The permittee must demonstrate compliance with these conditions upon request by the Division of Water Resources.

Signed: _____

Stewart Lovell, P.G.
Manager
Water Allocations

Date: _____

April 8, 1996

xc: Bureau of Environmental Health
United States Geological Survey
Delaware River Basin Commission

DELAWARE RIVER BASIN COMMISSION
P.O. BOX 7360
WEST TRENTON, NEW JERSEY 08628-0360

COPY

Project Review

NOTICE OF COMMISSION ACTION

Date: January 25, 2005

Docket No. D-96-50 CP-2

Project Sponsor: United Water Delaware
Attention: Nancy J. Trushell
2000 First State Boulevard
P.O. Box 6508
Wilmington, Delaware 19804

Project Description: Stream Encroachment Tidal Capture Structure and Surface Water
Withdrawal Project

Action by Commission:

Incorporated in the Commission's *Comprehensive Plan* for the Delaware River Basin and approved pursuant to Section 3.8 of the *Delaware River Basin Compact*. See attached docket for terms and conditions.

Explanatory Note:

The action has been taken by the Commission in accordance with its responsibilities under Sections 3.8, 11.1 and 11.2 of the *Delaware River Basin Compact*. The Commission maintains a comprehensive water resources plan for the Delaware River Basin and reviews water resources projects proposed by other public and private agencies. Review of projects enables the Commission to prevent conflicts among water users and to protect the integrity of the *Comprehensive Plan*.



Pamela M. Bush, Esquire
Commission Secretary

Enclosure

c: Kevin C. Donnelly, DNREC
Dr. Harry W. Otto, DNREC
Stewart Lovell, Water Supply, DNREC
Duffield Associates, Inc.
Mary Ellen Noble, Delaware Riverkeeper Network

CP/3.8

DOCKET NO. D-96-50 CP-2

DELAWARE RIVER BASIN COMMISSION

**United Water Delaware
Stream Encroachment Tidal Capture Structure and
Surface Water Withdrawal Project
White Clay Creek, Stanton, New Castle County, Delaware**

PROCEEDINGS

This docket is issued in response to an application submitted by United Water Delaware (UWD) on September 14, 2004, for renewal of an allocation of surface water approved by the Delaware River Basin Commission (DRBC) on August 4, 1993. Condition "m." of the 1993 docket decision was extended and required that this project be reviewed within 10 years of the date of approval, and unless renewed, the approval would expire. The UWD application also includes a revision to the operating plan of the Tidal Capture Structure (TCS) originally docketed under D-96-50 CP. The project was originally approved by the Delaware Department of Natural Resources and Environmental Control (DNREC) on July 16, 1993.

The application was reviewed for continuation of the project in the Comprehensive Plan and approval under Section 3.8 of the *Delaware River Basin Compact*. The New Castle County Planning Department has been notified of pending action on this docket. A public hearing on this project was held by the DRBC on January 19, 2005.

DESCRIPTION

Purpose. The purpose of this project is to continue withdrawal of 30 million gallons per day (mgd) to provide supply to the applicant's public water distribution system, originally docketed under D-91-72 CP, and for a proposed revision to the operating plan of the Tidal Capture Structure (TCS) docketed under D-96-50 CP.

Location. UWD maintains three project intakes, two Stanton intakes located on the White Clay Creek, and one Christiana intake located on Smalley's Pond on the Christina River. Stanton Intake No. 1 is approximately 1,000 feet downstream of the confluence of Red Clay Creek, at River Mile 70.7-10.3-2.2, and Stanton Intake No. 2 is located just upstream of the confluence of Red Clay Creek at River Mile 70.7 - 10.3 - 2.25. The Christiana intake is located at the dam site on Smalley's Pond on the Christina River. The White Clay Creek intakes provide raw water to the adjacent Stanton Water Treatment Plant. The Christiana intake provides water to UWD's Christiana Water Treatment Plant, a small treatment plant located adjacent to the pond. The Stanton facilities are located near Stanton in New Castle County, Delaware at 2000 First State Boulevard.

D-96-50 CP-2 (United Water Delaware - Stream Encroachment Tidal Capture Structure and Surface Water Withdrawal Project)

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UWD maintains a Tidal Capture Structure (TCS) located on the White Clay Creek, a tributary of the Christina River, at River Mile 70.73 - 10.3 - 1.8, approximately 4,500 feet downstream from the Stanton intakes. The location of the project facilities is further described as:

DESCRIPTION	LATITUDE (N)	LONGITUDE (W)
Intake 1	39°42'23"	75°38'44"
Intake 2	39°42'25"	75°38'44"
Smalley's Pond Intake	39°39'12"	75°40'12"
Tidal Capture Structure	39°42'03"	75°39'00"

Area served. No change in service area is proposed. United Water Delaware (UWD) will continue to serve a major portion of northern New Castle County, Delaware. UWD has interconnections for both active and emergency use which enable transfer of water between other public water suppliers throughout northern New Castle County. A small in-Basin portion of Cecil County, Maryland is also served by UWD. In general, the UWD service area consists of three districts: an area of approximately 13 square miles just north of the Chesapeake and Delaware Canals and west of the Delaware River (River Road Franchise Area); an area of approximately 18 square miles just north of the City of Wilmington and west of the Delaware River (North Franchise Area); and an area of approximately 21 square miles south of the City of Newark (South Franchise Area).

Physical features.

a. **Design criteria.** UWD's primary treatment facility is the Stanton Water Treatment Plant which has a 30 mgd treatment capacity. The Stanton intakes, coupled with a pre-Compact smaller treatment facility (Christiana Plant) located at Smalley's Dam on the Christina River, constitute the UWD entire water supply sources other than via purchases from other in-state and out-of-state purveyors. The Christiana Plant is used for peaking capacity and for limited backup to the Stanton Plant. For emergency use, Hoopes Reservoir can release up to 5 mgd to the Red Clay Creek to enable UWD to withdraw at its Stanton intake for treatment and distribution during low flows. The Smalley's Pond withdrawal and water treatment plant can provide up to 6 mgd.

The TCS was constructed in 1997 for the primary purpose of improving UWD's ability to withdraw from the White Clay Creek during low stream flows. The TCS operating status is determined by regular monitoring of stream flows as published continuously by the Delaware Geologic Survey's calibrated stream gages. The facility is controlled remotely from the Stanton WTP to provide for immediate operational adjustments as needed. Operations include inflation to improve intake conditions or to provide protection from downstream contamination which may be incoming with the tide. Deflation, to ensure upstream flooding is

not exacerbated is also part of the remotely controlled operation system. An adjustable sluice gate at the south side of the TCS controls passing flow.

UWD currently serves approximately 36,650 customers with an average and maximum demand of 630 mg/30 days, and 755 mg/30 days, respectively. The UWD highest historical peak water use occurred in 2001, with a total demand of 27.56 mgd. Of the total UWD demand, approximately 26% is provided for residential use, 17% for commercial, 35% for industrial, 5% for plant and system use, 5% other, less than 1% for other public water suppliers and 11% for unaccounted losses. For the year 2029, UWD projects that they will serve approximately 40,200 customers with an average and maximum demand of 615 mg/30 days, and 798 mg/30 days, respectively, with a slight increase in the percentage of residential use.

b. **Facilities.** The project facilities consist of two intakes on the White Clay Creek. Intake No. 1 is on the north bank of White Clay Creek below the confluence of Red Clay Creek and is controlled by Pumphouse No. 1. Intake No. 2 was constructed in the 1960's and is located on the south bank of White Clay Creek above the confluence of Red Clay Creek and is connected by pipe to Pumphouse No. 2. Intake No. 2 is used alone in the event of any stream contamination such as an oil spill, in the Red Clay Creek. Pumphouse No. 1 is equipped with two 7,000 gallon per minute capacity pumps. Pumphouse No. 2 is equipped with three 7,000 gallon per minute capacity pumps.

The Stanton Water Treatment Plant can provide peak treatment capacity of up to 30 mgd. The plant provides coagulation, flocculation, sedimentation, filtration and disinfection. The Christiana Plant was constructed in the early 1900's on the 40-million-gallon (mg) Smalley's Pond on the Christina River located just southwest of the Route 7 and Old Baltimore Pike intersection.

The TCS facility is an inflatable structure approximately 125 feet long installed across the White Clay Creek. The structure inflates to approximately 5 feet above the stream bed. By-pass sluice gates are used for the purpose of controlling pass-by flows as required. Remote controls from the Stanton Plant provide for immediate operational adjustments when needed.

UWD maintains five interconnections with Artesian Water Company, and three interconnections with the City of Wilmington, all for emergency use. UWD has one interconnection with the Chester Water Authority (Post Road), which is used regularly under contract for 4.1 million gallons per month. UWD also has one interconnection with United Water Bethel, which provides approximately 700,000 gallons per day, but is expected to decrease due to growing demand in Bethel.

For purposes of managing chlorides in the White Clay Creek during drought conditions, UWD has a raw water contract with the City of Wilmington for releases of

D-96-50 CP-2 (United Water Delaware - Stream Encroachment Tidal Capture Structure and Surface Water Withdrawal Project)

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raw water from Hoopes Reservoir. Water releases are metered before entry to the Red Clay Creek, which transports it to the Stanton Water Treatment Plant intake. The agreement between UWD and the City of Wilmington calls for UWD to state a reservation amount annually for which a fee is paid based on the reserved volume. The current maximum amount reserved is 200 million gallons. Releases can be increased on a daily basis under the authority of the Commissioner of Public Works on a case-by-case basis.

The project treatment facilities are above the 100-year flood elevation.

All withdrawals, water service connections and interconnections with other distribution systems are metered.

c. **Other.** Wastewater is conveyed to the New Castle County sewage treatment facility (formerly known as the City of Wilmington sewage treatment plant), most recently approved by DRBC Docket No. D-98-26 CP on November 15, 2000. The treatment facility has adequate capacity to receive wastewater from the proposed project.

Relationship to the Comprehensive Plan. The project was previously included in the Comprehensive Plan by Docket D-91-72 CP on August 4, 1993 which approved the UWD withdrawal of up to 30 mgd from White Clay Creek. The TCS was previously included in the Comprehensive Plan by Docket D-96-50 CP approved on April 30, 1997. The proposed project is in conformance to policy recommendations of the Water Supply Facility Plan for northern New Castle County, first included in the Comprehensive Plan via Docket No. D-84-10 CP on September 25, 1984. The proposed project is also in conformance to policy recommendations of the Delaware Water Supply Coordinating Council.

FINDINGS

Since the April 30, 1997 issuance of Docket D-96-50 CP, which approved the use of the TCS, UWD has twice requested and received emergency suspension of the passby requirement of 17 mgd on the White Clay Creek. The emergency requests were made on July 29, 1999 and August 5, 2002, both after periods of extended low precipitation conditions, and during which chloride concentrations at the Stanton Plant intakes were in excess of 250 ppm. The proposal to permanently modify the operating plan for UWD's TCS contained in the subject docket, is based on protection of the water supply at the Stanton Plant intake, and substantiated through several consultant reports on instream flow needs and biological assessments.

Resolution 2002-27 revised the D-96-50 CP docket (Amendment No. 2) with the addition of Condition "m" which required UWD to:

- Continue to implement mandatory State water conservation measures;

- Conduct a feasibility analysis of raising the level of Hoopes Reservoir to increase its public water supply storage capacity;
- Conduct a cost/benefit analysis of the feasibility of installing desalination facilities at UWD's Stanton Plant; and
- Develop a new operating plan that addresses minimum instream flow needs at the tidal/fresh water interface near the TCS during normal and drought conditions.

In October 2002, Duffield Associates, a consultant to UWD conducted a biological assessment of the tidally influenced portion of the White Clay Creek near Stanton, Delaware. Duffield Associates concluded, based upon field sampling, that the fish population in the studied reach is healthy, diverse and of the appropriate species that is typical of brackish habitat. Their findings further suggested that the extreme drought conditions occurring in 2002 with regard to lower fresh water flows, lower dissolved oxygen, and higher chlorides, did not have a significant adverse impact on the fish population as gauged by the target species "White Perch". The apparent reason for this is that twice daily, the flood tide of approximately four foot depth enables the biota to maintain its viability. Duffield Associates concluded that the fresh water inflow to the tidal reach of the White Clay Creek (i.e. the 7Q10 passby flow) may not be a necessary condition for biota health.

In addition to the in stream flow study, Duffield Associates further undertook a study of the potential impact of the TCS on bog turtles. In a report entitled "United Water Delaware Hydrologic Analysis", Duffield Associates states that "The depth to water in the potential [bog turtle] habitat was approximately one foot below the ground surface during the entire observation period. Therefore, under non-flood conditions the stream gauge does not have a direct impact on the land surface habitat. Furthermore, based on the information gathered, the natural tidal fluctuations of over two feet do not have any observable impact on ground water elevations in the potential bog turtle habitat. Both of these observations lead to the conclusion that the potential bog turtle habitat is not directly impacted by natural changes in the stream level and, therefore, would also be unaffected by any hydrologic changes resulting from the proposed change in [TCS] operation." Duffield Associates concluded that the proposed TCS operation will not have an impact on the potential bog turtle habitat either near the TCS or at areas more distant. A subsequent study conducted by Duffield Associates determined there are no bog turtles living in the potential habitat areas.

A separate instream flow study on the White Clay Creek was conducted by Gerald Kauffman and Kevin Vonck at the University of Delaware, Water Resources Authority, in March 2002. The study conducted by Kauffman and Vonck concluded that minimum critical depths of water below the TCS were more significant factors in protection of the biota in the White Clay Creek than a minimum passby flow volume. The report recommended "the withdrawal of up to 30 mgd from the White Clay Creek at the Stanton Water Treatment Plant provided the 7Q10 flow equivalent depth does not decline below 0.85'/0.90'/0.96'/(1.0') and the

chloride levels in the raw water at the Stanton intake do not exceed 250 ppm." The preceding sequence of numbers typifies the depths relative to a changing channel width over a specific physical habitat transition reach.

The Northern New Castle County area has made major advances in the regional water supply planning and in development of additional water supplies since 1999. Under the auspices of the Delaware Water Supply Coordinating Council, major water suppliers in the region have or will soon complete projects that will increase the amount of water available during drought conditions by nearly 1.1 billion gallons. Additional projects are under consideration that will further increase supply by 471 to 1,020 million gallons. Legislation enacted in Delaware – the Water Supply Self-Sufficiency Act of 2003 (HB 118) – establishes requirements to ensure that water utilities in Northern New Castle County "...have adequate supplies of water available, even in times of drought, to meet the present and future needs of this State on a continuing and sustainable basis." The proposed change to the operation of the TCS will help UWD achieve this requirement.

The project is designed to conform to the requirements of the *Water Code* and *Water Quality Regulations* of the DRBC.

The DRBC estimates that the project withdrawals, used for the purpose of public water supply, result in a consumptive use of ten percent of the total water use. The DRBC definition of consumptive use is defined in Article 5.5.1.D of the *Administrative Manual – Part III – Basin Regulations – Water Supply Charges*.

The project does not conflict with the Comprehensive Plan and is designed to prevent substantial adverse impact on the water resources related environment, while sustaining the current and future water uses and development of the water resources of the Basin.

DECISION

- I. Effective on the approval date for Docket No. D-96-50 CP-2 below:
 - a. The projects described in Docket Nos. D-91-72 CP and D-96-50 CP are removed from the Comprehensive Plan to the extent that they are not included in Docket No. D-96-50 CP-2; and
 - b. Docket Nos. D-91-72 CP and D-96-50 CP are rescinded and replaced by Docket No. D-96-50 CP-2.
 - c. The project and the appurtenant facilities described in the Section entitled "Physical features" above shall be added to the Comprehensive Plan.

II. The project and appurtenant facilities as described in the Section entitled "Physical features" above are approved pursuant to Section 3.8 of the *Compact*, subject to the following conditions:

a. Docket approval is subject to all conditions, requirements, and limitations imposed by the DNREC, and such conditions, requirements, and limitations are incorporated herein, unless they are less stringent than the Commission's.

b. During any 30-day period, the combined withdrawal from the project intakes on the White Clay and Red Clay Creeks shall not exceed 900 million gallons.

c. The applicant's water supply sources including surface water and interconnections and the associated operational records shall be available at all times for inspection by the DRBC.

d. The surface water intakes and interconnections shall be operated at all times to comply with the requirements of the *Water Code* and *Water Quality Regulations* of the DRBC.

e. The docket holder shall operate the Tidal Capture Structure (TCS) in accordance with the attached operating plan. Any revision to the TCS operating plan shall be approved by the Executive Director.

f. The docket holder shall pay for surface water use in excess of amount shown in Certificate of Entitlement in accordance with the provisions of Resolution No. 74-6, as amended.

g. The project withdrawals shall be metered with an automatic continuous recording device that measures to within 5 percent of actual flow. An exception to the 5 percent performance standard, but no greater than 10 percent, may be granted if maintenance of the 5 percent performance is not technically feasible or economically practicable. A record of daily withdrawals shall be maintained, and monthly totals shall be reported to the DNREC annually and shall be available at any time to the Commission if requested by the Executive Director.

h. Each new water service connection shall include a water meter in accordance with the DRBC's Resolution No. 87-7 (Revised).

i. In accordance with DRBC Resolution No. 87-6 (Revised), the docket holder shall continue to implement to the satisfaction of the DNREC, the systematic program to monitor and control leakage within the water supply system. The program shall at a minimum include: periodic surveys to monitor leakage, enumerate unaccounted-for water and determine the current status of system infrastructure; recommendations to monitor and control leakage; and a schedule for the implementation of such recommendations. The docket holder shall proceed expeditiously to correct leakages and unnecessary usage identified by the program.

j. No water service connections shall be made to newly constructed premises with plumbing fixtures and fittings that do not comply with water conservation performance standards contained in Resolution No. 88-2 (Revision 2).

k. The docket holder shall continue to implement its Water Conservation Plan as approved by DNREC, and shall report to the DNREC on actions taken pursuant to this program and the impact of those actions as requested by the DNREC.

l. The docket holder shall implement to the satisfaction of the DNREC, a drought or other water supply emergency plan.

m. No new water service connections shall be made to premises connected to sewerage systems which are not in compliance with all applicable effluent limits contained in State permits and the *Water Quality Regulations* of the Commission.

n. Nothing herein shall be construed to exempt the docket holder from obtaining all necessary permits and/or approvals from other State, Federal or local government agencies having jurisdiction over this project.

o. The area served by this project is limited to the service area as described above. Any expansion beyond this area is subject to review in accordance with Section 3.8 of the *Compact*.

p. This docket approval will expire on the expiration date indicated below unless the docket holder has submitted a complete application for renewal of this docket 12 months prior to the expiration date below, or permission has been granted by the DRBC for submission at a later date. In the event that a timely and complete application for renewal has been submitted and the DRBC is unable, through no fault of the docket holder, to reissue the docket before the expiration date, the terms and conditions of this docket will automatically continue and remain fully effective and enforceable pending the grant or denial of the application for docket approval.

q. The issuance of this docket approval shall not create any private or proprietary rights in the water of the Basin, and the Commission reserves the rights to amend, alter or rescind any actions taken hereunder in order to insure the proper control, use and management of the water resources of the Basin.

r. If the monitoring required herein, or any other data or information demonstrates that the operation of this project significantly affects or interferes with any domestic or other existing wells or surface water supplies, or if the docket holder receives a complaint by any user of wells or surface water supplies within the zone of influence of the withdrawal, the docket holder shall immediately notify the Executive Director of any complaints by users of wells or surface water supplies within the zone of influence of the withdrawal, and unless excused by the Executive Director, shall investigate such complaints. Any well or surface

water supply which is substantially adversely affected, or rendered dry or otherwise unusable as a result of the docket holder's project withdrawal, shall be repaired, replaced or otherwise mitigated at the expense of the docket holder. A report of investigation and/or mitigation plan prepared by a hydrologist shall be submitted to the Executive Director as soon as practicable. The Executive Director shall make the final determination regarding the validity of such complaints, the scope or sufficiency of such investigations, and the extent of appropriate mitigation measures, if required. The Executive Director may modify or suspend this approval, or require mitigating measures, pending additional review.

s. For the duration of any drought emergency declared by either Delaware or the Commission, water service or use by the docket holder pursuant to this approval shall be subject to the prohibition of those nonessential uses specified by the Governor of Delaware, or DNREC to the extent that they may be applicable, and to any other emergency resolutions or orders adopted hereafter by the Commission.

BY THE COMMISSION

APPROVAL DATE: January 19, 2005

EXPIRATION DATE: July 16, 2023

UNITED WATER DELAWARE

OPERATING PLAN

Tidal Capture Structure (TCS) Operating Plan

Stage 1: Natural stream flow equal to, or greater than, 47.2 mgd and chlorides immediately at the outlet of the TCS bypass structure downstream of TCS less than 250 ppm.

TCS may be operated (partial inflation and gates open) in such a fashion that natural stream flows (less 30 mgd net withdrawal) will be released to the downstream side of TCS.

Stage 2: Natural stream flow less than 47.2 mgd but greater than or equal to 17.2 mgd and chlorides immediately at the outlet of the TCS bypass structure downstream of TCS less than 250 ppm.

TCS may be operated twice daily (full inflation/deflation at tidal cycles). Minimum flow-by rate of 17.2 mgd to be maintained for the two (2), ½-hour periods daily when there is an absence of tide immediately downstream of the TCS.

Stage 3: Natural stream flow less than 17.2 mgd and chlorides immediately at the outlet of the TCS bypass structure downstream of TCS less than 250 ppm.

The TCS may be operated twice daily (full inflation/deflation at tidal cycles). Minimum flow-by rate equal to the natural stream flow will be maintained for the two (2), ½-hour periods when there is an absence of tide downstream of the TCS.

Stage 4: Natural stream flow less than 17.2 mgd or chlorides immediately at the outlet of the TCS bypass structure downstream of the TCS greater than 250 ppm.

The TCS may be fully inflated and remain inflated throughout multiple tidal cycles. By-pass gates at the TCS to be used, as necessary, to blend, supplement and maintain the pool upstream of the TCS at chloride levels less than 250 ppm (average pool concentration). No minimum flow-by is required.

UNITED WATER DELAWARE

OPERATING PLAN **(CONTINUED)**

Salinity Monitoring

- When the natural stream flow at the Stanton WTP is equal to or less than 37 mgd for five (5) consecutive days, United Water will commence twice-weekly conductivity measurements at the bridge over the Christina River near Ciba Specialty Chemicals.

Stream Flow at Stanton WTP = (White Clay Creek Stream Flow Near Newark USGS Gage #01479000 x 1.11) + (Red Clay Creek Stream Flow at Stanton USGS Gage #01480015)

- When specific conductance at the bridge over the Christina River near Ciba Specialty Chemicals correlates to 250 ppm chloride concentration, United Water will notify the Temporary Water Coordinator for New Castle County and will begin daily measurements at the DNREC Churchman's Road Boat Ramp, the downstream side of the Tidal Capture Structure (TCS) and the Stanton WTP Low Service #1 Pump house intake.
- When specific conductance begins to show an upward trend at the Churchman's Road Boat Ramp, United Water will notify the City of Wilmington of an impending request for water releases from Hoopes Reservoir.
- The monitoring frequency may revert back to the twice-weekly schedule at Ciba Specialty Chemicals after stream flows at the Stanton WTP exceed 37 mgd for 5 days.
- The monitoring may cease after significant rainfall events indicated chlorides are at normal background levels of around 50 ppm at the Churchman's Road Boat Ramp.

Exhibit 10

**Exhibit 10
Christiana Water Treatment
Plant Allocation Permit (DNREC)**



COPY

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
& ENVIRONMENTAL CONTROL
DIVISION OF WATER RESOURCES
89 KINGS HIGHWAY, P.O. Box 1401
DOVER, DELAWARE 19903

PUBLIC WATER ALLOCATION

ALLOCATION NO: 90-0014
EFFECTIVE DATE: April 8, 1996
EXPIRATION DATE: April 8, 2026

Pursuant to the provisions of 6010f, 7 Del. C., an allocation of water is hereby granted to:

UNITED WATER DELAWARE
Christiana Water Treatment Plant
2000 First State Blvd.
P. O. Box 6508
Wilmington, Delaware 19804

for the withdrawal and use of water from the following water facilities:

<u>Intake #</u>	<u>Location</u>	<u>Stream</u>	<u>Latitude</u>	<u>Longitude</u>	<u>Maximum Pumping Capacity (gpm)</u>
Pump house #1	Smalley's Pond	Christina River	39°39'12"	75°40'15"	8000

OTHER APPROVALS

1. This approval is subject to review every five years from effective date by the Division of Water Resources.
2. This approval is subject to all appropriate regulations and approvals of the Delaware River Basin Commission.
3. Approval for the use of this water for human consumption must be obtained from the Bureau of Environmental Health.
4. Approval for discharge of this water must be obtained from the Division of Water Resources.
5. This approval is subject to modification in accordance with establishment of State instream flow and passby requirements.

Delaware's good nature depends on you!

EQUIPMENT REQUIREMENTS

1. All facilities must be equipped with appropriate metering equipment in accordance with accepted engineering practice for recording pumping rates and cumulative volumes of pumpage to a design accuracy of $\pm 5\%$.

REPORTING PROCEDURE

1. For each facility: Readings of pumping rates, and cumulative pumpage must be made and recorded at least daily. This and all other requested information, such as water purchases and sales, is to be recorded on a form provided by the Division of Water Resources and submitted by the permit holder to the Division annually by January 31, or more frequently if requested.

ALLOCATION

1. In any twenty-four (24) hour period: Pumpage from this intake may not exceed 6,000,000 gallons. Total pumpage from all surface water intakes combined must not exceed 36,000,000 gallons.
2. In any thirty (30) day period: Pumpage from this intake may not exceed 180,000,000 gallons. Total pumpage from all surface water intakes combined must not exceed 1,080,000,000 gallons.
3. In any twelve (12) month period: Pumpage from this intake may not exceed 2,190,000,000 gallons. Total pumpage from all surface water intakes must not exceed 13,140,000,000 gallons.
4. Withdrawals for the sources listed below shall not exceed the following limits:

<u>Intake #</u>	<u>Permit #</u>	<u>Maximum Pumping Rate (gallons/day)</u>
Pumphouse #1	8006	6,000,000

5. These intakes may be used only for the purpose of public supply. Any change in the intended use, or in the physical characteristics of this facility must receive prior approval from the Division of Water Resources.

6. All laws and regulations governing the construction, operation, maintenance, and repair of water wells and water supplies in the State of Delaware will be obeyed.
7. Representatives of the Division of Water Resources, Delaware Geological Survey and the U.S. Geological Survey may inspect these facilities, conduct any tests, and collect any samples at any time deemed necessary.
8. This allocation is specifically subject to the requirements of 7 Del. C. s6031.
9. If the withdrawal of water pursuant to this allocation has significant adverse affects including, but not limited to, reduction of streamflows, lowering of water levels, migration of pollutants, or encroachment of salt water, the Division of Water Resources may require action to rectify the problem.
10. This permit is transferable only if the requirements of the Regulations Governing the Allocation of Water are met and, written approval is obtained from the Division of Water Resources.
11. Violations of conditions of this permit are subject to penalties provided in 7 Del. C., Chapter 60.
12. WATER CONSERVATION MEASURES

This approval is contingent on practice by the permit holder of reasonable efforts to minimize the unnecessary use and/or waste of water. The permittee must:

- A. Establish a program of periodic monitoring and evaluation of water usage,
- B. Establish a systematic leak detection and control program which is responsive to high unaccounted for water usage rates, routine maintenance, or discovery of leaks,
- C. Use the best practical methods and devices to conserve water,
- D. Alert employees and customers of the need to conserve water and reduce wasteful usage, including conservation suggestions in water bills, and

E. Develop a contingency plan to be implemented in the event of water shortage emergencies. This plan should include:

1. Identification of emergency water sources,
2. Priorities of water usage, and
3. Emergency measures to curtail water usage.

The permittee must demonstrate compliance with these conditions upon request by the Division of Water Resources.

Signed: _____

Stewart Lovell
Stewart Lovell, P.G.
Manager
Water Supply Section

Date: _____

April 8, 1996

cc: Bureau of Environmental Health
Delaware River Basin Commission
United States Geological Survey

Exhibit 11

**Exhibit 11
Christiana Well Allocation
Permit (DNREC & DRBC)**



STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES &
ENVIRONMENTAL CONTROL
DIVISION OF WATER RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

JUL 2 2001

Anthony Langley
General Manager
United Water Delaware
2000 First State Boulevard
Wilmington, Delaware 19804

Dear Mr. Langley: *Tony*

RE: DNREC W.A.P. 01-0011

Please find enclosed the above referenced water allocation permit for withdrawal and use of water from the Christina Plant well. Please ensure that all appropriate company personnel are aware of the permit conditions.

By copy of this letter, I am forwarding DNREC's approval and the application material to the Delaware River Basin Commission for their review. You should expect action by DRBC shortly and they will contact you directly if there are any questions.

I look forward to our continued collaboration on developing and protecting Delaware's water resources.

Sincerely,

Stewart Lovell, P.G.
Manager,
Water Supply Section

enclosure

c: Tom Brand, DRBC

Delaware's good nature depends on you!



STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES &
ENVIRONMENTAL CONTROL
DIVISION OF WATER RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

PUBLIC WATER ALLOCATION

ALLOCATION NO: 01-0011
EFFECTIVE DATE: June 13, 2001
EXPIRATION DATE: June 13, 2031

Pursuant to the provisions of 6010f, 7 Del. C., an allocation of water is hereby granted to:

United Water Delaware
2000 First State Boulevard
Wilmington, Delaware 19804

for the withdrawal and use of water from the following water facility:

WELL NO.	LOCATION	AQUIFER	LATITUDE	LONGITUDE	CAP.
1	Christina Plant	Potomac	39° 39' 15.78''	75° 40' 13.13''	200 gpm

OTHER APPROVALS

1. This approval is subject to review every five years from effective date by the Division of Water Resources.
2. This approval is subject to all appropriate regulations and approvals of the Delaware River Basin Commission (DRBC).
3. Approval for the use of this water for human consumption must be obtained from the Division of Public Health, Office of Drinking Water.
4. Approval for discharge of this water must be obtained from the Division of Water Resources.

EQUIPMENT REQUIREMENTS

1. This well must be equipped with a meter for recording water withdrawal rates and cumulative volume of pumpage to a design accuracy of +5%.
2. This well must be equipped with the following mechanism for recording water levels: a readily accessible $\frac{1}{2}$ " minimum I.D. capped-port with drop-line. A pressure transducer may be used in conjunction with the above device. Air-line gages are not permitted.

REPORTING REQUIREMENTS

1. Readings of pumping rates and cumulative volume of pumpage must be made and recorded at least daily. Readings of pumping water levels must be made and recorded at least weekly. This and any other information, such as water purchases and sales, is to be recorded in a format provided by the Division of Water Resources and submitted by the permit holder to the Division annually by January 31, or more frequently if requested.

ALLOCATION

1. In any twenty-four (24) hour period: Pumpage from this well must not exceed 288,000 gallons.
2. In any thirty (30) day period: Pumpage from this well must not exceed 8,700,000 gallons.
3. In any twelve (12) month period: Pumpage from this well must not exceed 35,000,000 gallons.
4. Withdrawals for the source listed below shall not exceed the following limits:

WELL NO.	DNREC ID NO.	PUMPING RATE (GPD)	WATER LEVEL(FBLS)
1	10850	288,000	215

5. This well may be used only for the purpose of public supply and related uses.
6. All laws and regulations governing the construction, operation, maintenance, and repair of water supply facilities in the State of Delaware must be obeyed.

7. Representatives of the Division of Water Resources, Delaware Geological Survey and the U.S. Geological Survey may inspect these facilities, conduct any tests, and collect any samples at any time deemed necessary.
8. This allocation is specifically subject to the requirements of 7 Del C., Chapter 6031 regarding compensation to persons whose supply is effected by withdrawals pursuant to the permit.
9. If the withdrawal of water pursuant to this permit has significant adverse affects including, but not limited to, reduction of streamflows, lowering of water levels, migration of pollutants, or encroachment of salt water, the Division of Water Resources may require action to rectify the problem.
10. This permit is transferable only if the requirements of the Regulations Governing the Allocation of Water are met and, written approval is obtained from the Division.
11. Violations of conditions of this permit are subject to penalties provided in 7 Del. C., Chapter 60.
12. Any change in the use, withdrawal source, or physical characteristics of the above facility must receive prior approval from the Division of Water Resources.
13. This approval does not guarantee any specific quantity or quality of water.

WATER CONSERVATION MEASURES

This approval is contingent on practice by the permit holder of reasonable efforts to minimize the unnecessary use and/or waste of water. The permit holder must:

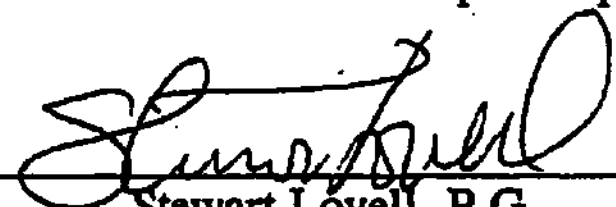
- A. Establish a program of periodic monitoring and evaluation of water usage,
- B. Establish a systematic leak detection and control program which is responsive to high unaccounted for water usage rates, routine maintenance, and discovery and repair of leaks,
- C. Use the best practical methods and devices to conserve water,
- D. Alert employees and customers of the need to conserve water and reduce wasteful usage, including conservation suggestions in water bills, and

E. Develop a contingency plan to be implemented in the event of a water shortage emergency. This plan should include:

1. Identification of emergency water sources,
2. Priorities of water usage, and
3. Emergency measures to curtail water usage.

The permittee must demonstrate compliance with these conditions upon request by the Division of Water Resources.

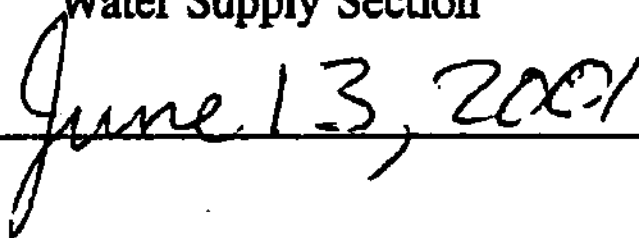
Signed: _____


Stewart Lovell, P.G.

Manager

Water Supply Section

Date: _____


June 13, 2001

c: Delaware River Basin Commission

DELAWARE RIVER BASIN COMMISSION
P.O. BOX 7360
WEST TRENTON, NEW JERSEY 08628

COPY

Project Review

NOTICE OF COMMISSION ACTION

Date: April 5, 2002

Docket No. D-2001-37 CP

Project Sponsor: United Water Delaware
Attn: Theodore Harris
2000 First State Boulevard
P.O. Box 6508
Wilmington, Delaware 19804-0508

Project Description: Ground Water Withdrawal

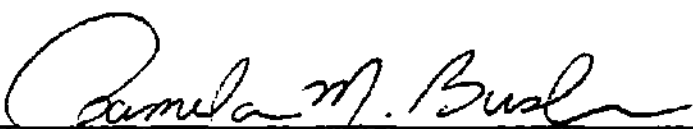
Referred by: Delaware Department of Natural Resources and Environmental
Control

Action by Commission:

Incorporated in the Commission's Comprehensive Plan for the Delaware River Basin and approved pursuant to Section 3.8 of the Delaware River Basin Compact. See attached docket for terms and conditions.

Explanatory Note:

The action has been taken by the Commission in accordance with its responsibilities under Sections 3.8, 11.1 and 11.2 of the Delaware River Basin Compact. The Commission maintains a comprehensive water resources plan for the Delaware River Basin and reviews water resources projects proposed by other public and private agencies. Review of projects enables the Commission to prevent conflicts among water users and to protect the integrity of the Comprehensive Plan.


Pamela M. Bush, Commission Secretary
and Assistant General Counsel

Enc.

c: Kevin C. Donnelly, Harry W. Otto, Stewart Lovell, DNREC

CP/3.8

DOCKET NO. D-2001-37 CP

DELAWARE RIVER BASIN COMMISSION

United Water Delaware
Ground Water Withdrawal
New Castle County, Delaware

PROCEEDINGS

This is an application referred to the Commission, pursuant to an Administrative Agreement under Sections 2-3.4 (a) and 2-3.7 of the *Administrative Manual - Part II, Rules of Practice and Procedure*, by the Delaware Department of Natural Resources and Environmental Control (DNREC) on July 2, 2001, for an allocation of ground water and review of a ground water withdrawal project. The project well was approved by the DNREC on June 13, 2001, (Permit No. 01-0011), subject to approval by the Delaware River Basin Commission (DRBC).

The application was reviewed for inclusion of the project in the Comprehensive Plan and approval under Section 3.8 of the Delaware River Basin Compact. The New Castle County Planning Commission has been notified of pending action on this docket. A public hearing on this project was held by the DRBC on April 3, 2002.

DESCRIPTION

Purpose. - The purpose of this project is to supply up to 8.7 mg/30 days to the applicant's public water supply distribution system from new Well No. 1.

Location. - The project well is located in the Christina River watershed, as follows:

WELL NO.	LATITUDE (N)	LONGITUDE (W)
1	39° 39' 16"	75° 40' 13"

The project well is in the Potomac Formation.

Area served. - The United Water Delaware (UWD) Well No. 1 is proposed as a backup and supplemental source to UWD's distribution system, which is presently sourced entirely from surface water. The UWD distribution system serves a major portion of northern New Castle County and uses two surface water supply sources in the Christina River watershed; the major source being provided via the project intakes on the White Clay Creek and the Smalley's Pond intake on the Christina River

approximately 10 river miles upstream of the White Clay Creek confluence with the Christina River. UWD has 14 interconnections for both active and emergency use which enable a total maximum transfer of approximately 13.5 mgd from other purveyors, including 2 mgd transferred from systems in Delaware County, Pennsylvania and 10 mgd from the City of Wilmington, and export 8.5 mgd to other purveyors in New Castle County.

In general, the UWD service area consists of three districts; an area of approximately 13 square miles just north of the Chesapeake and Delaware Canal and west of the Delaware River, an area of approximately 18 square miles just north of the City of Wilmington and west of the Delaware River, and an area of approximately 21 square miles south of the City of Newark. The three service areas are separated by the service areas of Artesian Water Company and the City of Wilmington.

Physical features. -

a. **Design criteria.** - UWD is proposing Well No. 1 as a backup and supplemental source to their distribution system which currently relies on surface water sources. Well No. 1 will be directly connected to the Christiana Water Treatment Plant and will be utilized primarily in times of drought and low flow stream conditions. UWD projects an average and maximum demand of 23.7 mgd (711 mg/30 days) and 31.0 mgd (835 mg/30 days), respectively, for the year 2005. System storage represents 30.8 mg, or approximately one day of supply.

b. **Facilities.** - The proposed project well has the following characteristics:

WELL NO.	DEPTH	CASED DEPTH/ CASING DIAMETER	PUMP CAPACITY	YEAR DRILLED
1	306'	215-239'/275-306'	200 gpm	1968

All water service connections are metered.

The project well is metered.

UWD maintains regular and emergency interconnections with Chester Water Authority (0.3 mgd capacity), United Water Bethel (1.5 mgd capacity), the City of Wilmington (3.75 mgd capacity) and Artesian Water Company (0.5 mgd capacity).

The project well is located above the 100-year flood elevation.

c. **Other.** -- Wastewater is conveyed to the City of Wilmington Wastewater treatment facility most recently approved by DRBC Docket No. D-98-26 CP on November 15, 2000. The treatment facility has adequate capacity to receive wastewater from the proposed project.

Cost. - The overall cost of this project is estimated to be \$25,000.

Relationship to the Comprehensive Plan. - Well No. 1 has not been previously included in the Comprehensive Plan. However, Well No. 1 will provide water to the service area currently served

by UWD's two existing surface water intakes which are included in the Comprehensive Plan through Dockets D-91-72 CP and D-96-50 CP.

FINDINGS

The project is designed to conform to the requirements of the Ground Water Policy of the DRBC.

The DNREC water allocation is valid for a period of 30 years from date of issue, with review every five years.

The proposed well is in conformance with the recommendations of the Governor's Water Supply Task Force and the Delaware Water Supply Coordinating Council to provide additional water supply in New Castle County and helps fulfill condition "p" of Docket D-91-72 CP requiring the development of alternate water supplies to improve redundancy for New Castle County to design year 2025.

Project withdrawals are used for the purpose of public water supply and the consumptive use is estimated to be 10 percent of the total water use.

The project does not conflict with nor adversely affect the Comprehensive Plan, is physically feasible, and does not adversely influence the present or future use and development of the water resources of the Basin.

DECISION

- I. Well No. 1, as described above is hereby added to the Comprehensive Plan.
- II. The project as described above is approved pursuant to Section 3.8 of the *Compact*, subject to the following conditions:
 - a. Approval is subject to all conditions imposed by the DNREC.
 - b. The well shall be available at all times for inspection by the DRBC.
 - c. The well shall be operated at all times to comply with the requirements of the ground water policies and standards of the DRBC.
 - d. During any 30-day period, the withdrawal from Well No. 1 shall not exceed 8.7 million gallons.
 - e. The proposed well shall be equipped with readily accessible capped port and drop pipe so that water levels may be measured under all conditions. Existing wells are to be similarly equipped.

where possible, with readily accessible ports and drop pipes as repairs or modifications are made at each existing well.

f. The applicant shall pay for surface water use in excess of amount shown in the Certificate of Entitlement in accordance with the provisions of Resolution No. 74-6, as amended.

g. This approval shall expire three years from date below unless prior thereto the applicant has commenced operation of the subject project or has expended substantial funds (in relation to the cost of the project) in reliance upon this approval.

h. The project diversions shall be metered with an automatic continuous recording device that measures to within 5 percent of actual flow. An exception to the 5 percent performance standard, but no greater than 10 percent, may be granted if maintenance of the 5 percent performance is not technically feasible or economically practicable. A record of daily withdrawals shall be maintained, and monthly totals shall be reported to the DE DNREC annually and shall be available at any time to the Commission, if requested by the Executive Director.

i. Each new water service connection shall include a water meter in accordance with the DRBC's Resolution No. 87-7 (Revised).

j. The applicant shall continue to implement its Water Conservation Plan as approved by DNREC, and will report to the DNREC on actions taken pursuant to this program and the impact of those actions as requested by the agency.

k. No water service connections shall be made to newly constructed premises with plumbing fixtures and fittings that do not comply with water conservation performance standards contained in Resolution No. 88-2 (Revision 2).

l. The applicant shall implement to the satisfaction of the DNREC, a drought or other water supply emergency plan.

m. No new water service connections shall be made to premises connected to sewerage systems that are not in compliance with all applicable water quality standards of the Commission.

n. Nothing herein shall be construed to exempt the applicant from obtaining all necessary permits and/or approvals from other State, Federal or local government agencies having jurisdiction over this project.

o. Any substantial change or expansion beyond the service area described herein is subject to review in accordance with Section 3.8 of the Compact.

p. This approval will be reviewed within ten years of the date of approval, and unless renewed, this approval shall expire ten years from the date of approval.

q. The issuance of this withdrawal permit shall not create any private or proprietary rights in the water of the Basin and the Commission reserves the rights to amend, alter, or rescind any actions

taken hereunder in order to insure the proper control, use, and management of the water resources of the Basin.

r. If the operation of this project significantly affects or interferes with any domestic or other existing wells or surface water supplies, the applicant, at its own cost, shall investigate valid complaints by users of wells or surface water supplies within the zone of influence of the diversion. Any well or surface water supply which is substantially adversely affected, rendering it dry or otherwise unusable as a result of the applicant's project diversion, shall be repaired, replaced or otherwise mitigated at the expense of the applicant. A report of investigation shall be submitted to the Executive Director of the Commission as soon as practicable. The Commission shall make the final determination regarding the validity of such complaints, the scope or sufficiency of such investigations, and the extent of appropriate mitigation measures, if required.

s. For the duration of any drought emergency declared by the Commission, water service or use by the project applicant pursuant to this approval shall be subject to the prohibition of those nonessential uses specified by the DNREC to the extent that they may be applicable, and to any other emergency resolutions or orders adopted hereafter.

BY THE COMMISSION

DATED: April 3, 2002

Exhibit 12

**Exhibit 12
Duffield Report**

**UNITED WATER DELAWARE
SOURCE WATER AVAILABILITY STUDY**

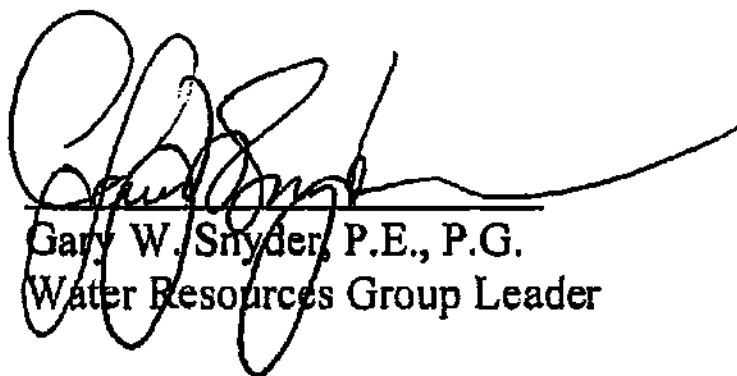
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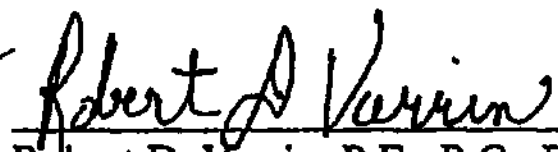
Prepared for:


United Water Delaware
2000 First State Boulevard
Wilmington, Delaware 19808

Prepared by:

Duffield Associates, Inc.
5400 Limestone Road
Wilmington, Delaware 19808


Gary W. Snyder, P.E., P.G.
Water Resources Group Leader


Robert D. Varrin, P.E., P.G., Ph.D.
Senior Consultant


Francis E. Greene, E.I.
Project Engineer

Project No. 5363.CD

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FIGURES

- Figure 2.1 United Water Delaware Schematic Drawing
 Figure 4.1 Flow Source Stanton Plant July
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 Figure 4.3 Flow Source Stanton Plant September

APPENDICES

- Appendix A Projected Availability for Stanton Plant
 Appendix B Projected Availability for Christiana Plant

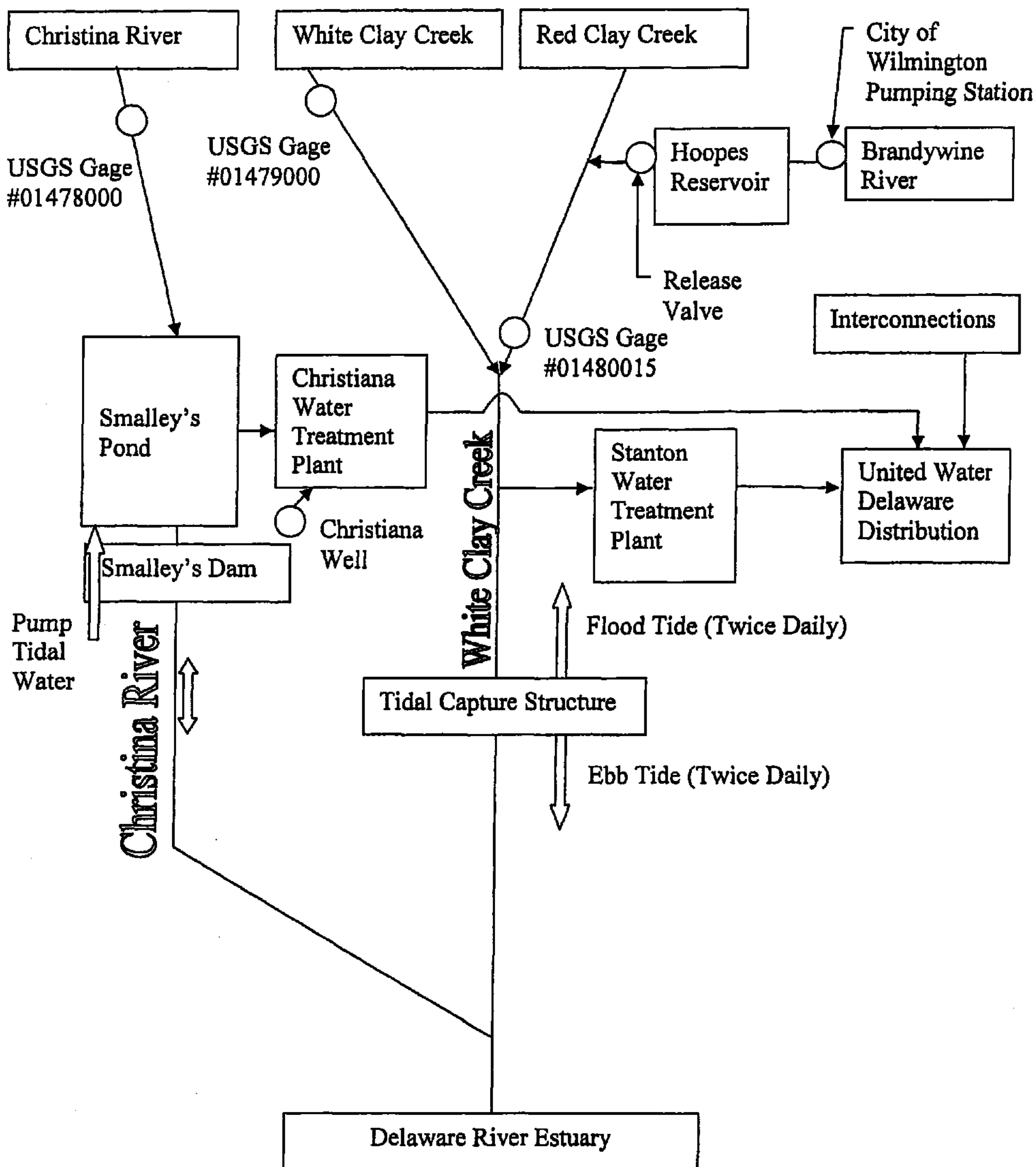
1. INTRODUCTION

This study, performed by Duffield Associates, Inc. (Duffield Associates) for United Water Delaware (UWDE) evaluates the availability of specific water supplies used by UWDE in serving its customers in the State of Delaware. The subject water supplies include the Stanton and Christiana Water Treatment Plants' source waters.

2. BACKGROUND

UWDE supplies water to the public using: Stanton Plant, Christiana Plant and interconnections with various neighboring water purveyors. Figure 2.1 schematically illustrates the UWDE plants and system.

Figure 2.1, below, schematically presents the raw water supply system and related components associated with the Stanton Plant and the Christiana Plant; the two UWDE plants that deliver finished water to their Delaware customers.



3. PROJECT OBJECTIVE

This report is being completed at the request of UWDE to evaluate the impact that 2002 drought conditions would have on UWDE's ability to reliably produce finished water to meet projected 2009 daily demand of 23.6 mg as determined by the Water Supply Coordinating Council.

4. APPROACH

The purpose of this study is to determine if UWDE has the ability to produce enough water to meet 2009 demand projections during the drought of record. The drought of record has been previously defined by Delaware's Water Master as the 75 day period from July 1, 2002 through September 15, 2002. This period forms the boundaries for data analyzed in this study.

The approach utilized in this study was to take each day within the drought period as an individual event and determine if the supply goal can be reached for that specific day. The evaluation then looked at the cumulative effect that all of the days had on water reserves to determine if the total volumes of the various system sources were sufficient for the entire period of the drought. Flow values were analyzed based upon mean daily flows, as is customary in the industry and used in prior evaluations. Stream-flow rates are based on USGS gage sites, extrapolated to the drainage basin areas above the Stanton and Christiana Plants, adjusted to compensate for Hoopes flow provided by the City of Wilmington. In contrast, chloride data are based on chloride levels measured by UWDE during high tides. Therefore, the raw water chloride values used generally represent the highest chloride values.

Based on the daily mean method, a water balance for each site was calculated. This balance is based on the mean daily flows of the various source waters. The daily mean water balance is shown in the following equation:

$$Q_{out} = \sum Q_{in}$$

Where Q_{out} is the total potential supply of the plant and Q_{in} is the flow supply for each component (e.g. stream, tidal, and reservoir, etc.). If the summation of all of the Q_{in} values is greater than the required output for each plant as stated above, then the source water is available at the plants to provide sufficient supply and meet customer demand.

When evaluating the chloride levels in the finished water and consequently exiting the plant, a similar method was used. The chloride levels were calculated by the following equation:

$$M_{out} = \frac{\sum Q_{in} M_{in}}{Q_{out}}$$

Where M_{Out} is the allowable chloride level of the plant intake water (230 ppm), assuming a 20 ppm increase during the plant treatment process, and M_{In} is the chloride level for that respective input component. The objective is to balance the source water in low-flow conditions, when high chlorides persist, and make sure that M_{Out} will not result in finished water that exceeds SDWA secondary standard for chlorides of 250 ppm.

4.1 STANTON PLANT

The Stanton Plant is located on the White Clay Creek just below the confluence of the White Clay Creek and the Red Clay Creek. Approximately 0.5 miles downstream of the plant UWDE previously constructed an inflatable structure designed to capture tidal water for use in the plant. An additional source, Hoopes Reservoir, is located approximately 5 miles upstream of the plant on Red Clay Creek. Hoopes Reservoir, owned by the City of Wilmington can release, when necessary, raw water to augment the flow in the Red Clay Creek for use at Stanton. Due to these characteristics, the Stanton Plant can draw water from these three sources; the White Clay Creek (which includes the flow from the Red Clay Creek), tidal water which is captured by the Tidal Capture Structure (TCS), and Hoopes reservoir.

4.1.1 WHITE CLAY CREEK AND RED CLAY CREEK FLOW CHARACTERISTICS

In order to determine the flow characteristics at the plant, USGS stream gage data for the White Clay Creek and the Red Clay Creek were used. For the White Clay Creek, White Clay Creek near Newark, Delaware (USGS Gage # 01479000) is the closest stream gage to the plant, and for the Red Clay Creek, Red Clay Creek near Stanton, Delaware (USGS Gage # 01480015) is closest to the plant. However, since these two gages are located distances upstream of the confluence, these flow gages alone are not representative of the flow at the plant. In order to determine the representative flows at the plant, the USGS recommends the application of an extrapolation factor, based on relative watershed areas. The watershed area for the USGS gage at White Clay Creek near Newark is 89.1 mi², while the watershed area for the White Clay Creek at the confluence of the Red Clay Creek is 103.7 mi². The extrapolation factor for the White Clay Creek is calculated based on the ratio of the areas, or 103.7/89.1, equaling a factor of 1.16. The Red Clay Creek extrapolation factor was calculated similarly. The watershed area for the stream gage near Stanton is 52.4 mi² and the drainage area for the entire creek is 54.0 mi². The extrapolation calculations yield a ratio of 54.0/52.4 and a factor of 1.03.

Based on the extrapolation factors the mean daily stream flow was calculated. For example, on August 17, 2002 the mean stream flow data for the stream gage located at White Clay Creek near Newark was

measured to be 5.4 cfs. Extrapolating this for the larger watershed area confluent to the plant (1.16) yields a projected mean daily flow of 6.3 cfs (4.1 mgd). The Red Clay Creek near Stanton measured a mean stream flow of 14.0 cfs. Converting to mgd yields a flow of 9.1 mgd. The extrapolation calculation for Red Clay Creek is calculated in section 4.1.4. Flows for other days during the study period were calculated similarly.

Calculations required establishing a chloride concentration for the non-tidal "natural" stream flows. Data indicates that normal background chloride levels in the creek are generally in the 30-40 ppm range. A conservative estimate of 40 ppm was used for this study.

4.1.2 TIDAL CAPTURE STRUCTURE (TCS)

The TCS is located approximately 0.5 miles downstream of the Stanton Plant. Since the tidal effects change from one tide to another, an average tidal elevation was used (4.0 feet) to determine the total storage volume behind the TCS. Based on these parameters, when the TCS is fully inflated, a total volume of 6 million gallons of water can be captured behind the TCS. Since the tidal cycle occurs twice daily, a total volume of 12 million gallons can be captured. During drought and extreme low flow conditions with no Hoopes flow augmentation, all of the 12 million gallons is considered to be tidal water.

The tidal water generally contains high chloride levels during extreme low-flow periods. UWDE's Stanton Plant personnel manually monitor the chloride levels of the tidal water at the TCS. The chloride sample is collected just after the high tide when the mixing of the water is complete and chloride levels are generally at their highest. For the purpose of this study, this sample point is considered to be representative of the entire tidal flow and is used for the water balance calculations presented herein. It should be noted that this sampling procedure uses peak chloride values in contrast to average chloride values. This approach conservatively represents the chloride levels in the tidal pool which in turn portrays the chloride level at the maximum rather than the average daily value. Reporting of chlorides for the SDWA uses average daily values.

4.1.3 DROUGHT OPERATIONS AT PLANT

UWDE's Operating Plan for the TCS was approved by the Delaware River Basin Commission in 2005. The plan is divided into four stages depending on the natural streamflow at Stanton and the chloride level in the tidal water. All of the critical days during the 2002 drought, fall into the category of Stage 4 which states:

- Natural stream flow less than 17.2 mgd or chloride 50 feet

downstream of the TCS greater than 250 ppm (these conditions exist less than 1% of the time); and

- The TCS may be fully inflated and remain inflated throughout the multiple tidal cycles. By-pass gates at the TCS to be used, as necessary, to blend, supplement, and maintain the pool upstream of the TCS at chloride levels less than 250 ppm (average pool concentration). No minimum flow-by is required.

The key element in the approved Stage 4 of the TCS Operation Plan is the ability of UWDE to use the bypass gates at the TCS to blend, supplement, and maintain the pool upstream of the TCS at chloride levels less than 230 ppm. This means that a controlled amount of tidal water with a specific chloride concentration can be allowed into the pool of freshwater held behind the TCS. The "natural" stream flow's freshwater (~ 40 ppm chloride) will then dilute the tidal water to acceptable chloride levels for potable water use. The process involves the management of the calibrated bypass gates during the high-tide events to move the tidal water by gravity to the upstream TCS pool. As was mentioned earlier, the net addition from this procedure to the Stanton Treatment Plant intake is considered to be 12 million gallons per day.

4.1.4 HOOPES RESERVOIR

Water from the Hoopes Reservoir can be released into the Red Clay Creek where it then flows to the Stanton Plant raw water pool. Because the stream gage located on the Red Clay Creek is downstream of the release point of Hoopes Reservoir, any release from Hoopes was recorded by the gage. In order to determine how much natural flow was being conveyed by the stream alone (without any Hoopes release influences), the amount of the Hoopes release must be known. UWDE supplied the Hoopes release amounts for the study period. The flow produced by the stream is calculated by subtracting the amount of Hoopes release from the extrapolated flow in the stream at the plant.

Using the data from August 17, 2002 as an example, Hoopes released 6.0 million gallons of water on that day. In the example described above, it was demonstrated that the flow from the Red Clay Creek equaled 9.1 mgd. Subtracting the Hoopes release from the stream flow data (9.1-6.0), it can be seen that 3.1 mgd was supplied by Red Clay Creek alone. This flow now needs to be extrapolated out for the larger watershed. The extrapolation factor for the Red Clay Creek is 1.03. The flow from the Red Clay Creek alone at the confluence is calculated to be 3.1 mgd. The total flow from both the White Clay Creek and the Red Clay Creek without any Hoopes influence is 7.2 mgd (4.1 mgd + 3.1 mgd).

The Hoopes reservoir water, being comprised principally of Brandywine River water, exhibits low chloride levels. Similar to the non-tidal natural stream flow of the White Clay Creek, the study assumed a conservative value of 40 ppm chlorides for the Hoopes Reservoir water.

4.1.5 WATER BALANCE

Since water usage and stream flow vary throughout the day, a dynamic model would be most appropriate, but extremely difficult to produce. Also, since this study is concerned with the daily water usage, a mean daily use method was employed. The water balance for the Stanton Plant encompasses the flow and the chloride levels in the stream, the TCS storage pool and Hoopes Reservoir releases for the drought of record (July 1, 2002 to September 15, 2002).

For the purpose of this study, UWDE requested Duffield Associates to determine the water that would be available to the Stanton Plant while attempting to limit Hoopes releases to 10 mgd. The results of the water balance performed for this evaluation can be seen in Appendix A. Appendix A can best be understood by referring to the example calculation provided in the following section. Figures 4.1 through 4.3 graphically illustrate the monthly input requirements for the Stanton Plant during the study period.

4.1.6 EXAMPLE CALCULATION

Appendix A presents the spreadsheet that was developed for this study. In an effort to clarify the calculations, an example calculation is presented for August 17th. UWDE's Stanton Plant is asked to supply 20.6 mgd. This value is derived from the 2009 demand for UWDE of 23.6 subtracting out 3.0 mgd for the Christiana Plant. It was already established in Section 4.1.4 that the stream produced 7.2 mgd for that day. The remaining amount of 13.4 mgd ($20.6 - 7.2$) must be supplied by the tidal water and/or Hoopes Reservoir releases.

In order to limit the amount of Hoopes water used, the maximum amount of allowable tidal water was first calculated. There are two limiting factors that determine the amount of tidal water that can be used. The first is the chloride concentration in the water. The average daily chloride level of the treated water is not to exceed 230 ppm at the intake. A weighted average method was used to determine the maximum amount of usable tidal water.

Figure 4.1

Flow Source Stanton Plant July

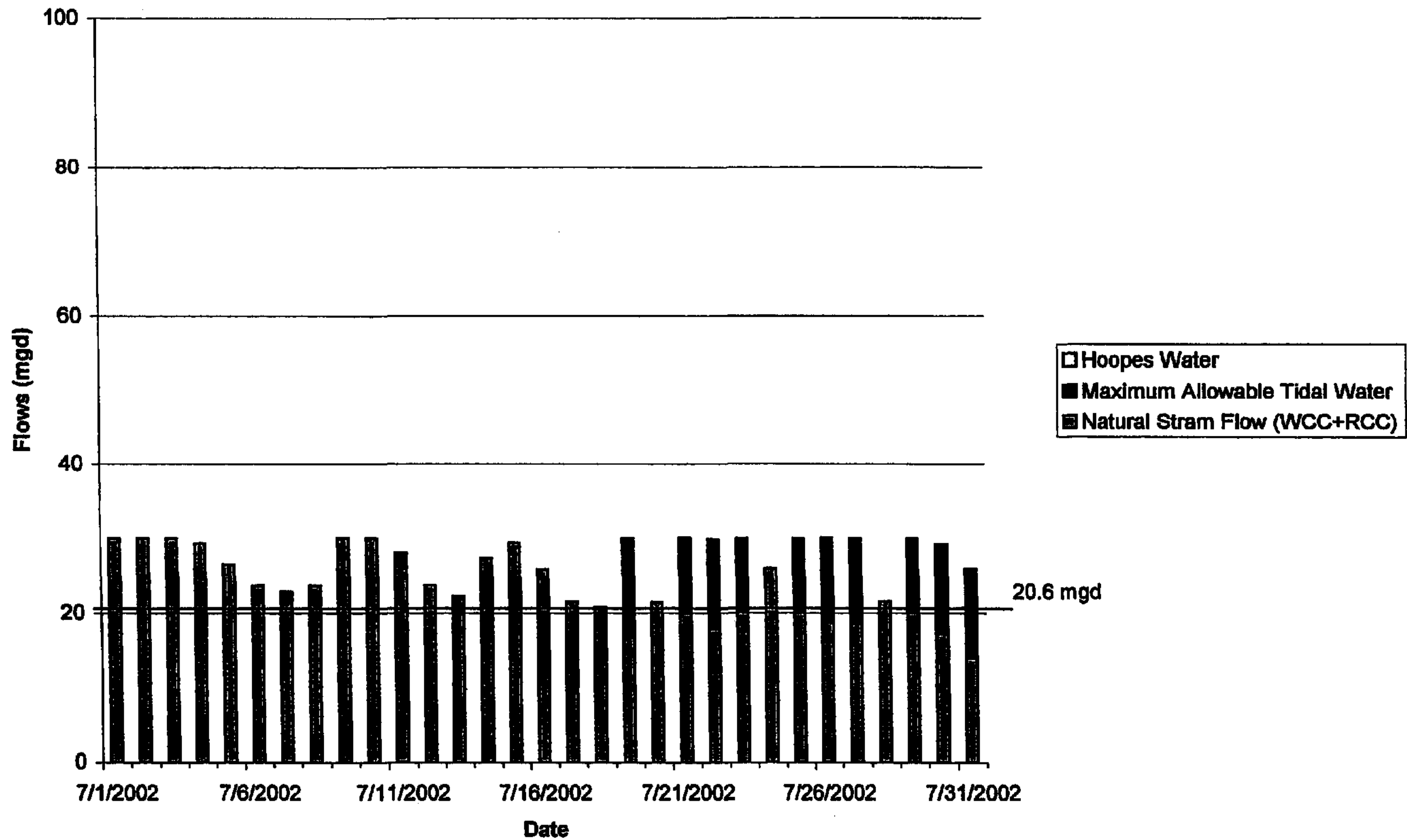


Figure 4.2



Flow Source Stanton Plant August

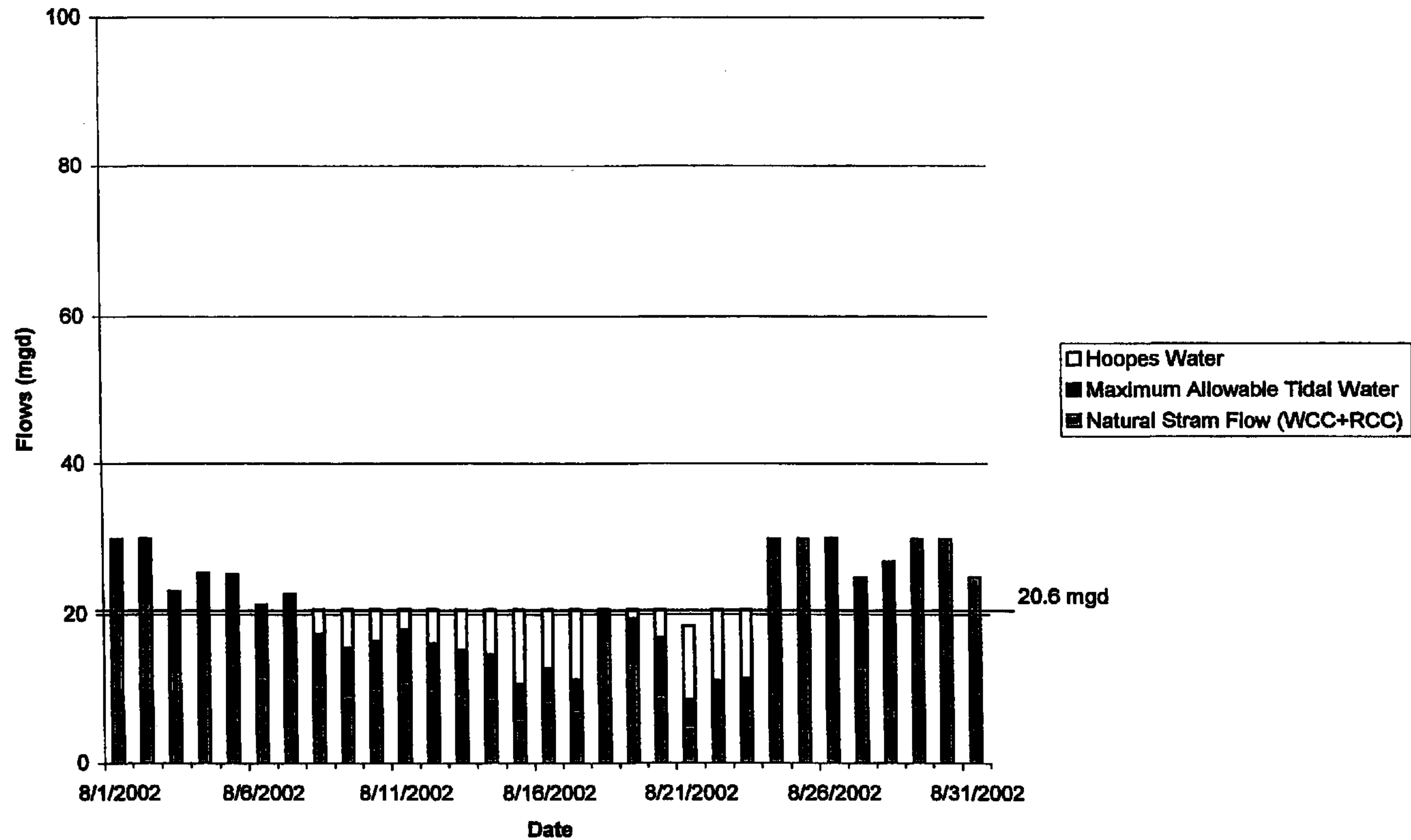
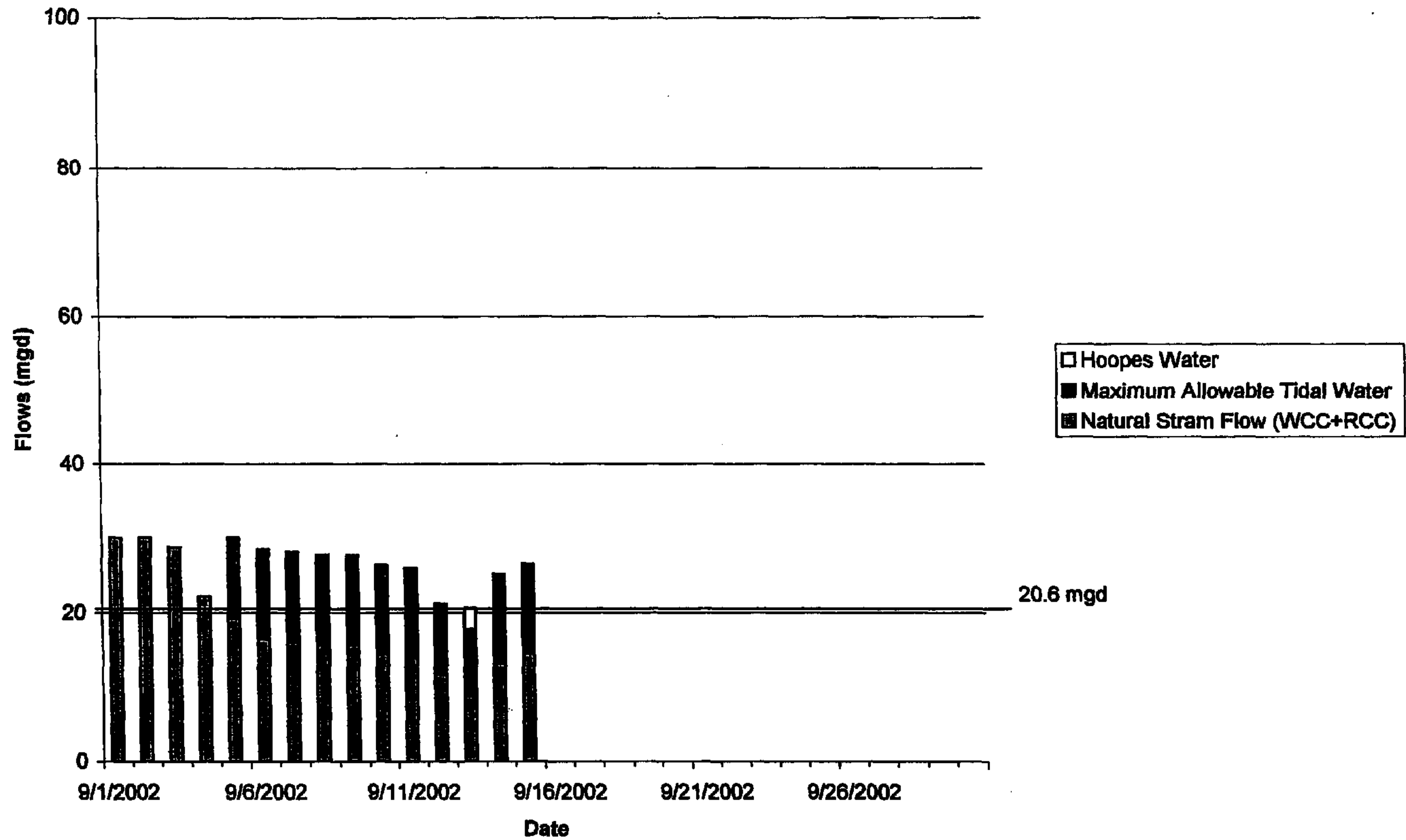


Figure 4.3



Flow Source Stanton Plant September



Rearranging prior equations from Section 4 to solve for the tidal volume, the following equation results:

$$Q_{Tidal} = \frac{Q_{Out} (M_{Max} - M_{Back})}{M_{Tidal} - M_{Back}}$$

Where:

Q_{Tidal} = Maximum tidal water allowed

Q_{Out} = The flow at Stanton to meet the projected need, 20.6 mgd

M_{Max} = Maximum allowable chloride levels entering the plant,
230 ppm

M_{Back} = Assumed background chloride levels in streams and Hoopes,
40 ppm

M_{Tidal} = Chloride levels recorded at the TCS during high tide of that
day

Solving for the maximum allowable tidal water (Q_{Tidal}) for August 17th results in 3.9 mgd. This is the maximum amount of tidal water that can be withdrawn from the tidal pool to limit the chloride level at the intake to 230 ppm for that day.

The second limiting factor for the amount of tidal water is the available volume in the stream. If the calculated volume is greater than the maximum allowable volume of 12 mgd (6 mg volume, twice per day), 12 mgd would be used. However, since this value (3.9 mgd) is less than the allowable volume, the calculated volume is used. Note that there are some days in which the volume is the limiting factor and more Hoopes release is required for additional supply.

Once the maximum allowable tidal water is calculated, the amount of needed Hoopes water can be determined. For August 17th, the total flow from the streams and tidal water equals 11.1 mgd (7.2 mgd + 3.9 mgd). Limiting Hoopes releases to 9.5 mgd provides the Stanton Plant with 20.6 mgd.

As a check, the total chloride level is calculated as a weighted average from the three sources (streams, tidal and Hoopes) to confirm that it is at or below the allowable level. In this case, the chloride level at the intake is 230 ppm.

Finally, the total amount of Hoopes Reservoir flow used is calculated to confirm that no more than 200 million gallons would be used in a given year. For all of the days up to and including August 17th, the calculated amount of Hoopes releases needed would equal 59.3 mg.

4.1.7 SUMMARY OF STANTON SUPPLY

During the 75-day drought of record, water supply needs were met or exceeded by the stream flow alone from the White Clay Creek and Red Clay Creek for a total of 30 days. An additional 28 days (for a total of 58 days) were sufficiently supplied by just the stream flow and tidal flow (no Hoopes releases were required for those days). For those 58 days, the Stanton Plant would produce a minimum of 20.6 mgd with chloride levels below the SDWA secondary standard chloride level of 250 ppm without requiring any Hoopes releases. The remaining 17 days would require Hoopes releases to meet the chloride standard. Of those 17 days, one day, August 21st would require more than 10 million gallons. The total amount of releases from Hoopes Reservoir for the drought of record is projected to be 96.5 million gallons.

4.2 CHRISTIANA PLANT

The Christiana Plant is located on the Christina River by Smalley's Pond. The Christina River flows into the pond. The pond then overflows at Smalley's dam into the tidal Christina River and ultimately flows into the Delaware River Estuary. The USGS maintains a stream gage on the Christina River at Cooches Bridge (USGS Gage # 01478000). Based on relative watershed areas, the USGS recommends a conversion factor of 2.23 for extrapolating the Cooches Bridge data to the Smalley's Pond site.

In a survey previously completed by Duffield Associates (2003), it was determined that the usable storage volume was approximately 18 mg. It is assumed that minimal siltation has occurred since 2003 and that the current storage volume will remain at 18 mg by 2009.

Smalley's dam provides storage and prevents tidal water from getting into Smalley's Pond. However, in times of drought, the pump below the dam at the Christiana Plant is used to pump tidal water into the pond for added supply. This practice can provide needed flow, albeit with potentially elevated chloride levels, to the plant intake at Smalley's Pond.

4.2.1 GENERAL APPROACH

There are four major components of source water for the Christiana Plant. The first is the Christina River. The first two rows in the table of Appendix B show the flow in the river at Cooches Bridge during the drought of record. The next two rows show the extrapolation and conversion for the Christiana Plant. The second source is Smalley's Pond, which is located at the plant. The third source is a groundwater supply well. This well has a permitted allocation of 0.288 mgd. Recent testing shows the well can reliably produce 0.288 mgd. The fourth source of

water is tidal in the Christina River below the Smalley's Pond dam. Smalley's Pond holds fresh water flow from the stream. However, in times of drought, water is pumped over the dam into the pond.

The Christiana Plant is normally operated at a rate of 3-4 mgd. For the purpose of this study, UWDE requested Duffield Associates to determine the reliable rate which would be supported by the most limiting source of supply (Smalley's Pond). Similar to the Stanton Plant analysis presented in Section 4.1, a daily mean approach was used to analyze the Christiana supplies.

4.2.2 WATER BALANCE

The primary source of water for this plant is the flow from the Christina River. If the flow from the river produces more than 3.25 mgd, then no other source would be necessary in times of drought. The table of Appendix B shows the 75 day drought of record period in 2002. From this table, it can be determined that for most days during the drought (53 days), the Christina River has sufficient flow to produce the desired finished water without any need to draw from other sources. For the other 22 days, the other sources would be required.

The first source to be utilized is the well. The well can reliably supply 0.288 mgd for use at the plant but a conservative value of 0.25 mgd was used for the water balance. Although the well is useful, it alone is not sufficient for most days so another source must be utilized.

The next source to be utilized is storage in Smalley's Pond. Smalley's Pond stores 18 mg of raw water. Effective storage, defined as water that can practically be withdrawn based on intake levels and reducing pool water quality, is estimated at 15 mg.

The final source that can be utilized is the tidal water. The tidal water can be pumped over the dam into the pond. Water can be pumped at a rate of 4.0 mgd. However, a flow rate of 0.5 mgd is used to minimize the introduction of chlorides into the pond. This rate would be sufficient to optimize the use of water from the pond while meeting SDWA secondary standards for chloride. Pumping should be started when the volume in the pond falls 0.5 million gallons.

Appendix B presents the calculated water balance for the Christiana Plant during the drought of record (July 1, 2002 to September 15, 2002). The maximum volume lost from Smalley's Pond is 11.93 mg

4.2.3 SUMMARY OF CHRISTIANA SUPPLY

For most of the drought period, the Christina River can sufficiently supply the Christiana Plant with more than 3.25 mgd of usable water. However, during a 19 day period, the river alone could not meet the required demand. Although the well aids in reaching the required output, water from Smalley's Pond is necessary.

During that 19 day period (August 5 through August 23), the necessary input from the pond ranges from 0.26 mgd to 1.56 mgd. The total required volume from the pond for that time period is 20.93 million gallons. However, with tidal water pumped into the pond, the total net loss in volume in the pond is 11.93 million gallons. The pumped water would have to be monitored to ensure the chloride levels do not exceed the safe drinking levels. Pumping early in the drought will allow more mixing to occur with the stream during that period and maintain needed storage in Smalley's Pond.

During the drought period, after the flow in the Christina River had dropped below the projected plant output of 3.25 mgd, there were 19 days in which the Christina River provided excess flow (recharge) to the pond. On August 24th, the flow from the Christina was 54.83 million gallons which fully recharged the pond.

5. CONCLUSION

This report was completed at the request of United Water Delaware to evaluate the impact source water availability, during the drought of record, would have on its ability to reliably produce finished water to meet projected 2009 daily demand of 23.6 million gallons. This request was prompted by the requirement for UWDE to prove self sufficiency of water supplies to the Delaware Public Service Commission.

The Stanton supply relies on the natural stream flow, tidal water capture and augmentation of flow by releases from Hoopes Reservoir. The analysis of the Stanton supply reveals that source water is available for all but one day (August 21) during the drought of record to allow treatment of 20.6 mgd at the Stanton Plant. To achieve quantity and chloride level objectives, the system requires flow augmentation from Hoopes Reservoir on 17 days for a total release of 96.5 mg.

The Christiana supply relies on the natural stream flow, storage in Smalley's Pond and supplemental flow from groundwater supplies and/or interim tidal-water pumping. The analysis of the Christiana supply reveals that the Christina River is available in excess of 3.25 mgd during most of the drought of record for treatment at the Christiana Plant and distribution of finished water. However, during the 75 day drought period analyzed, the natural Christina River flow alone was insufficient to provide 3.25 mgd for 19 days,

requiring supplemental sources to be used. Analysis confirmed the total available resources and operational practices to maintain storage can provide sufficient supply to the Christiana Water Treatment Plant.

The Stanton and Christiana systems have more than sufficient supply to easily meet projected demands during the great majority of conditions. The analysis of source availability during the drought of record (July 1, 2002 - September 15, 2002) demonstrates that the supplies for the Stanton Plant and the Christiana Plant are sufficient to meet the projected 2009 demand of 23.6 million gallons even during such drought conditions.

REFERENCES

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2. Duffield Associates, Inc. Correspondence to Robert M. Walker, General Manager, United Water Delaware, June 5, 1996.
3. Duffield Associates, Inc. Hydrographic Plan & Details Smalley's Pond Sheet 1 of 1, June 6, 1996.
4. Duffield Associates, Inc. *Wilmington Suburban Water Corporation Stanton Water Treatment 7Q10 Study*, September, 1994.

APPENDIX A

PROJECTED AVAILABILITY FOR STANTON PLANT

Legend:

WCC - White Clay Creek

RCC - Red Clay Creek

Gage Data - Daily mean streamflows recorded by USGS at specific gage locations on the stream

WCC Gage - White Clay Creek Near Newark, DE Gage # 01479000

RCC Gage - Red Clay Creek Near Stanton, DE Gage # 01480015

Extrapolated - Increase in flow due to increase in watershed size from gage location to confluence/Stanton Plant

Extrapolation factor of 1.16 for WCC and 1.03 for RCC

Hoopes - Flow released from Hoopes Reservoir

Cumulative Hoopes Usage - Total volume of water from Hoopes Reservoir

RCC - Hoopes - Flow contributed by the RCC alone (no Hoopes influence)

WCC+RCC-Hoopes - Flow contributed to Stanton plant by streams without Hoopes Reservoir contribution

Output (Stanton Plant) - Flow Stanton Plant produced for that day

Tidal Pool Water - Total amount of tidal flow necessary to maintain output level for that day

Tidal Pool Water = Output - (WCC + RCC)

Estimated Stream Chlorides - The assumed background chlorides in WCC and RCC

Max Chloride - Maximum allowable amount of chlorides for the Stanton Plant

Output Required - Minimum amount of output plant is required to produce

Stream Supply - Total flow provided by WCC and RCC combined (without Hoopes releases)

Maximum Tidal Water - Maximum allowable tidal water usage based on chloride levels and flow in the streams

Max Tidal Water + Stream Supply - Total projected output without Hoopes

Hoopes Required - Total flow required from Hoopes to reach the output required at the acceptable chloride level

Total Provided - Total amount of potable water possible for plant to provide



DUFFIELD
ASSOCIATES

UWDE Source Water Availability Study

Limit Hoopes to 10 mgd

2002 Usage and Chloride Data for

Stanton Plant



**DUFFIELD
ASSOCIATES**

Date			7/1/2002	7/2/2002	7/3/2002	7/4/2002	7/5/2002	7/6/2002	7/7/2002	7/8/2002	7/9/2002	7/10/2002
WCC	Gage Data	cfs	28.0	26.0	24.0	23.0	21.0	19.0	18.0	19.0	34.0	64.0
	Extrapolated	cfs	32.5	30.2	27.8	26.7	24.4	22.0	20.9	22.0	39.4	74.2
		mgd	21.0	19.5	18.0	17.3	15.8	14.3	13.5	14.3	25.5	48.0
RCC	Gage Data	cfs	20.0	19.0	19.0	18.0	16.0	14.0	14.0	14.0	21.0	29.0
		mgd	12.9	12.3	12.3	11.6	10.4	9.1	9.1	9.1	13.6	18.8
	Hoopes	mgd	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Cumulative Hoopes usage	mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	RCC - Hoopes	mgd	12.9	12.3	12.3	11.6	10.4	9.1	9.1	9.1	13.6	18.8
	Extrapolated	mgd	13.3	12.7	12.7	12.0	10.7	9.3	9.3	9.3	14.0	19.3
Combined	WCC+RCC-Hoopes	mgd	34.3	32.2	30.7	29.3	26.4	23.6	22.8	23.6	39.5	67.4
	Output (Stanton Plant)	mgd	17.4	20.8	19.4	18.0	19.1	19.0	19.4	18.4	22.1	23.6
	Tidal Pool Water	mgd	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chlorides	Raw Chlorides(Stanton Plt)	ppm	34.0	37.0	38.0	45.0	33.0	44.0	49.0	46.0	44.0	39.0
	TCS	ppm	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Projected Availability for Stanton Plant

Chloride Data	Estimated Stream Chlorides	ppm	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
	Maximum Chloride	ppm	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0
Flow Data	Output Required	mgd	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6
	Stream Supply	mgd	34.3	32.2	30.7	29.3	26.4	23.6	22.8	23.6	39.5	67.4
Combined Flow Data	Maximum Tidal Water	mgd	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	MaxTidal+Stream Supply	mgd	34.3	32.2	30.7	29.3	26.4	23.6	22.8	23.6	39.5	67.4
	Hoopes Required	mgd	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total Provided	mgd	30.0	30.0	30.0	29.3	26.4	23.6	22.8	23.6	30.0	30.0
	Chloride Level Out	ppm	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
Hoopes	Cumulative Hoopes usage	mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

This table is part of a report entitled "United Water Delaware Source Water Availability Study" and should only be viewed within context of that report

UWDE Source Water Availability Study

Limit Hoopes to 10 mgd

2002 Usage and Chloride Data for
Stanton Plant



Date			7/11/2002	7/12/2002	7/13/2002	7/14/2002	7/15/2002	7/16/2002	7/17/2002	7/18/2002	7/19/2002
WCC	Gage Data	cfs	24.0	20.0	19.0	23.0	24.0	21.0	18.0	17.0	16.0
	Extrapolated	cfs	27.8	23.2	22.0	26.7	27.8	24.4	20.9	19.7	18.6
		mgd	18.0	15.0	14.3	17.3	18.0	15.8	13.5	12.8	12.0
RCC	Gage Data	cfs	15.0	13.0	12.0	15.0	17.0	15.0	12.0	12.0	12.0
		mgd	9.7	8.4	7.8	9.7	11.0	9.7	7.8	7.8	7.8
	Hoopes	mgd	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Cumulative Hoopes usage	mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	RCC - Hoopes	mgd	9.7	8.4	7.8	9.7	11.0	9.7	7.8	7.8	7.8
	Extrapolated	mgd	10.0	8.7	8.0	10.0	11.3	10.0	8.0	8.0	8.0
Combined	WCC+RCC-Hoopes	mgd	28.0	23.7	22.3	27.3	29.3	25.8	21.5	20.8	20.0
	Output (Stanton Plant)	mgd	21.9	22.4	20.1	21.7	21.3	23.6	22.5	21.0	21.5
	Tidal Pool Water	mgd	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.3	1.5
Chlorides	Raw Chlorides(Stanton Plt)	ppm	63.0	42.0	42.0	46.0	40.0	56.0	43.0	55.0	69.0
	TCS	ppm	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	150.0

Projected Availability for Stanton Plant

Chloride Data	Estimated Stream Chlorides	ppm	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
	Maximum Chloride	ppm	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0
Flow Data	Output Required	mgd	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6
	Stream Supply	mgd	28.0	23.7	22.3	27.3	29.3	25.8	21.5	20.8	20.0
Combined Flow Data	Maximum Tidal Water	mgd	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0
	MaxTidal+Stream Supply	mgd	28.0	23.7	22.3	27.3	29.3	25.8	21.5	20.8	30.0
	Hoopes Required	mgd	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total Provided	mgd	28.0	23.7	22.3	27.3	29.3	25.8	21.5	20.8	30.0
	Chloride Level Out	ppm	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	76.6
Hoopes	Cumulative Hoopes usage	mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: TCS Chloride data for July 19 assumed to be 150 ppm max

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UWDE Source Water Availability Study

Limit Hoopes to 10 mgd

2002 Usage and Chloride Data for

Stanton Plant



Date			7/20/2002	7/21/2002	7/22/2002	7/23/2002	7/24/2002	7/25/2002	7/26/2002	7/27/2002	7/28/2002
WCC	Gage Data	cfs	16.0	15.0	14.0	17.0	23.0	16.0	16.0	15.0	18.0
	Extrapolated	cfs	18.6	17.4	16.2	19.7	26.7	18.6	18.6	17.4	20.9
		mgd	12.0	11.3	10.5	12.8	17.3	12.0	12.0	11.3	13.5
RCC	Gage Data	cfs	14.0	13.0	11.0	11.0	13.0	12.0	10.0	11.0	12.0
		mgd	9.1	8.4	7.1	7.1	8.4	7.8	6.5	7.1	7.8
	Hoopes	mgd	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Cumulative Hoopes usage	mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	RCC - Hoopes	mgd	9.1	8.4	7.1	7.1	8.4	7.8	6.5	7.1	7.8
	Extrapolated	mgd	9.3	8.7	7.3	7.3	8.7	8.0	6.7	7.3	8.0
Combined	WCC+RCC-Hoopes	mgd	21.3	19.9	17.8	20.1	25.9	20.0	18.7	18.6	21.5
	Output (Stanton Plant)	mgd	20.3	19.4	22.9	22.2	21.9	21.0	19.4	18.5	23.0
	Tidal Pool Water	mgd	0.0	0.0	5.0	2.1	0.0	1.0	0.8	0.0	1.5
Chlorides	Raw Chlorides(Stanton Pft)	ppm	47.0	59.0	76.0	71.0	56.0	55.0	40.0	45.0	51.0
	TCS	ppm	N/A	150.0	150.0	150.0	N/A	150.0	150.0	150.0	N/A

Projected Availability for Stanton Plant

Chloride Data	Estimated Stream Chlorides	ppm	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
	Maximum Chloride	ppm	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0
Flow Data	Output Required	mgd	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6
	Stream Supply	mgd	21.3	19.9	17.8	20.1	25.9	20.0	18.7	18.6	21.5
Combined Flow Data	Maximum Tidal Water	mgd	0.0	10.1	12.0	9.9	0.0	10.0	11.3	11.4	0.0
	MaxTidal+Stream Supply	mgd	21.3	30.0	29.8	30.0	25.9	30.0	30.0	30.0	21.5
	Hoopes Required	mgd	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total Provided	mgd	21.3	30.0	29.8	30.0	25.9	30.0	30.0	30.0	21.5
	Chloride Level Out	ppm	40.0	77.0	84.2	76.3	40.0	76.6	81.5	81.8	40.0
Hoopes	Cumulative Hoopes usage	mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: TCS Chloride data for July 21,22,23,25,26 and 27 assumed to be 150 ppm max.

This table is part of a report entitled "United Water Delaware Source Water Availability Study" and should only be viewed within context of that report

UWDE Source Water Availability Study

Limit Hoopes to 10 mgd

2002 Usage and Chloride Data for

Stanton Plant



Date			7/29/2002	7/30/2002	7/31/2002	8/1/2002	8/2/2002	8/3/2002	8/4/2002	8/5/2002	8/6/2002
WCC	Gage Data	cfs	16.0	14.0	12.0	22.0	16.0	10.0	9.8	9.6	9.5
	Extrapolated	cfs	18.6	16.2	13.9	25.5	18.6	11.6	11.4	11.1	11.0
		mgd	12.0	10.5	9.0	16.5	12.0	7.5	7.4	7.2	7.1
RCC	Gage Data	cfs	12.0	10.0	9.2	17.0	18.0	11.0	17.0	17.0	16.0
		mgd	7.8	6.5	6.0	11.0	11.6	7.1	11.0	11.0	10.4
	Hoopes	mgd	0.0	0.0	1.2	5.0	2.5	2.5	5.0	5.0	6.0
	Cumulative Hoopes usage	mg	0.0	0.0	1.2	6.2	8.7	11.2	16.2	21.2	27.2
	RCC - Hoopes	mgd	7.8	6.5	4.8	6.0	9.1	4.6	6.0	6.0	4.4
	Extrapolated	mgd	8.0	6.7	4.9	6.2	9.4	4.8	6.2	6.2	4.5
Combined	WCC+RCC-Hoopes	mgd	20.0	17.2	13.9	22.7	21.4	12.3	13.5	13.4	11.6
	Output (Stanton Plant)	mgd	20.4	21.3	22.2	22.9	24.0	23.8	20.0	19.6	19.6
	Tidal Pool Water	mgd	0.4	4.1	8.3	0.0	2.6	11.5	6.5	6.3	7.9
Chlorides	Raw Chlorides(Stanton Plt)	ppm	63.0	90.0	236.0	154.0	42.0	63.0	143.0	268.0	165.0
	TCS	ppm	200.0	220.0	210.0	400.0	400.0	400.0	367.0	260.0	444.0

Projected Availability for Stanton Plant

Chloride Data	Estimated Stream Chlorides	ppm	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
	Maximum Chloride	ppm	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0
Flow Data	Output Required	mgd	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6
	Stream Supply	mgd	20.0	17.2	13.9	22.7	21.4	12.3	13.5	13.4	11.6
Combined Flow Data	Maximum Tidal Water	mgd	10.0	12.0	12.0	10.9	10.9	10.9	12.0	12.0	9.7
	MaxTidal+Stream Supply	mgd	30.0	29.2	25.9	33.6	32.3	23.1	25.5	25.4	21.3
	Hoopes Required	mgd	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total Provided	mgd	30.0	29.2	25.9	30.0	30.0	23.1	25.5	25.4	21.3
	Chloride Level Out	ppm	93.3	114.0	118.8	175.2	173.5	209.2	193.5	144.0	223.8
Hoopes	Cumulative Hoopes usage	mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: TCS Chloride data for Aug 2 changed from 30 ppm to 400 ppm

Note: TCS Chloride data for Aug 3 changed from 40 ppm to 400 ppm

This table is part of a report entitled "United Water Delaware Source Water Availability Study" and should only be viewed within context of that report

UWDE Source Water Availability Study

Limit Hoopes to 10 mgd

2002 Usage and Chloride Data for

Stanton Plant



**DUFFIELD
ASSOCIATES**

Date			8/7/2002	8/8/2002	8/9/2002	8/10/2002	8/11/2002	8/12/2002	8/13/2002	8/14/2002	8/15/2002
WCC	Gage Data	cfs	8.4	7.1	7.5	7.9	7.3	6.3	7.3	6.7	6.1
	Extrapolated	cfs	9.7	8.2	8.7	9.2	8.5	7.3	8.5	7.8	7.1
		mgd	6.3	5.3	5.6	5.9	5.5	4.7	5.5	5.0	4.6
RCC	Gage Data	cfs	17.0	17.0	16.0	17.0	19.0	17.0	15.0	15.0	13.0
		mgd	11.0	11.0	10.4	11.0	12.3	11.0	9.7	9.7	8.4
	Hoopes	mgd	6.0	6.0	7.0	7.0	7.0	6.0	6.0	6.0	7.0
	Cumulative Hoopes usage	mg	33.2	39.2	46.2	53.2	60.2	66.2	72.2	78.2	85.2
	RCC - Hoopes	mgd	5.0	5.0	3.4	4.0	5.3	5.0	3.7	3.7	1.4
	Extrapolated	mgd	5.1	5.1	3.5	4.1	5.5	5.1	3.8	3.8	1.5
Combined	WCC+RCC-Hoopes	mgd	11.5	10.5	9.1	10.0	10.9	9.9	9.3	8.8	6.0
	Output (Stanton Plant)	mgd	20.7	18.7	18.8	18.2	19.3	18.4	18.8	20.5	17.7
	Tidal Pool Water	mgd	9.2	8.2	9.7	8.2	8.4	8.5	9.5	11.6	11.7
Chlorides	Raw Chlorides(Stanton Plt)	ppm	267.0	132.0	161.0	157.0	91.0	122.0	163.0	417.6	336.0
	TCS	ppm	385.0	619.0	658.0	665.0	604.0	676.0	710.0	743.0	899.0

Projected Availability for Stanton Plant

Chloride Data	Estimated Stream Chlorides	ppm	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
	Maximum Chloride	ppm	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0
Flow Data	Output Required	mgd	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6
	Stream Supply	mgd	11.5	10.5	9.1	10.0	10.9	9.9	9.3	8.8	6.0
Combined Flow Data	Maximum Tidal Water	mgd	11.3	6.8	6.3	6.3	6.9	6.2	5.8	5.6	4.6
	MaxTidal+Stream Supply	mgd	22.8	17.2	15.4	16.3	17.9	16.0	15.1	14.4	10.6
	Hoopes Required	mgd	0.0	3.4	5.2	4.3	2.7	4.6	5.5	6.2	10.0
	Total Provided	mgd	22.8	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6
	Chloride Level Out	ppm	211.7	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0
Hoopes	Cumulative Hoopes usage	mg	0.0	3.4	8.5	12.8	15.6	20.1	25.6	31.8	41.8

Note: TCS Chloride data for Aug 13 changed from 170 ppm to 710 ppm

This table is part of a report entitled "United Water Delaware Source Water Availability Study" and should only be viewed within context of that report

UWDE Source Water Availability Study

Limit Hoopes to 10 mgd

2002 Usage and Chloride Data for

Stanton Plant



Date			8/16/2002	8/17/2002	8/18/2002	8/19/2002	8/20/2002	8/21/2002	8/22/2002	8/23/2002	8/24/2002
WCC	Gage Data	cfs	6.1	5.4	9.1	9.5	7.3	6.5	6.1	6.1	52.0
	Extrapolated	cfs	7.1	6.3	10.6	11.0	8.5	7.5	7.1	7.1	60.3
		mgd	4.6	4.1	6.8	7.1	5.5	4.9	4.6	4.6	39.0
RCC	Gage Data	cfs	15.0	14.0	19.0	14.0	10.0	11.0	15.0	15.0	20.0
		mgd	9.7	9.1	12.3	9.1	6.5	7.1	9.7	9.7	12.9
	Hoopes	mgd	6.0	6.0	3.0	3.0	3.0	7.0	7.0	7.0	2.5
	Cumulative Hoopes usage	mg	91.2	97.2	100.2	103.2	106.2	113.2	120.2	127.2	129.7
	RCC - Hoopes	mgd	3.7	3.1	9.3	6.1	3.5	0.1	2.7	2.7	10.4
	Extrapolated	mgd	3.8	3.1	9.6	6.2	3.6	0.1	2.8	2.8	10.8
Combined	WCC+RCC-Hoopes	mgd	8.4	7.2	16.4	13.4	9.1	5.0	7.4	7.4	49.8
	Output (Stanton Plant)	mgd	18.8	17.9	20.6	19.0	17.6	17.1	19.7	19.4	20.0
	Tidal Pool Water	mgd	10.4	10.7	4.2	5.6	8.5	12.1	12.3	12.1	0.0
Chlorides	Raw Chlorides(Stanton Plt)	ppm	678.0	441.0	419.0	78.0	407.0	305.0	199.0	374.0	51.0
	TCS	ppm	970.0	1038.0	1033.0	700.0	550.0	1074.0	1122.0	1035.0	1239.0

Projected Availability for Stanton Plant

Chloride Data	Estimated Stream Chlorides	ppm	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
	Maximum Chloride	ppm	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0
Flow Data	Output Required	mgd	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6
	Stream Supply	mgd	8.4	7.2	16.4	13.4	9.1	5.0	7.4	7.4	49.8
Combined Flow Data	Maximum Tidal Water	mgd	4.2	3.9	3.9	5.9	7.7	3.4	3.6	3.9	0.0
	MaxTidal+Stream Supply	mgd	12.6	11.1	20.3	19.3	16.7	8.4	11.0	11.3	49.8
	Hoopes Required	mgd	8.0	9.5	0.3	1.3	3.9	10.0	9.6	9.3	0.0
	Total Provided	mgd	20.6	20.6	20.6	20.6	20.6	18.4	20.6	20.6	30.0
	Chloride Level Out	ppm	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0	66.4
Hoopes	Cumulative Hoopes usage	mg	49.8	59.3	59.5	60.8	64.7	74.7	84.3	93.6	93.6

Note: TCS Chloride data for Aug 16 changed from 260 ppm to 970 ppm

Note: On Aug 11, 11.8 mgd from Hoopes would be required to produce 20.6 mgd of raw water at 230 ppm chlorides at the Stanton Plant

This table is part of a report entitled "United Water Delaware Source Water Availability Study" and should only be viewed within context of that report

UWDE Source Water Availability Study

Limit Hoopes to 10 mgd

2002 Usage and Chloride Data for

Stanton Plant



Date			8/25/2002	8/26/2002	8/27/2002	8/28/2002	8/29/2002	8/30/2002	8/31/2002	9/1/2002	9/2/2002
WCC	Gage Data	cfs	41.0	15.0	10.0	13.0	292.0	45.0	19.0	103.0	53.0
	Extrapolated	cfs	47.6	17.4	11.6	15.1	338.7	52.2	22.0	119.5	61.5
		mgd	30.8	11.3	7.5	9.8	219.2	33.8	14.3	77.3	39.8
RCC	Gage Data	cfs	25.0	11.0	8.1	7.8	142.0	30.0	16.0	29.0	33.0
		mgd	16.2	7.1	5.2	5.0	91.9	19.4	10.4	18.8	21.4
	Hoopes	mgd	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Cumulative Hoopes usage	mg	129.7	129.7	129.7	129.7	129.7	129.7	129.7	129.7	129.7
	RCC - Hoopes	mgd	16.2	7.1	5.2	5.0	91.9	19.4	10.4	18.8	21.4
	Extrapolated	mgd	16.7	7.3	5.4	5.2	94.6	20.0	10.7	19.3	22.0
Combined	WCC+RCC-Hoopes	mgd	47.4	18.6	12.9	15.0	313.8	53.8	24.9	96.6	61.8
	Output (Stanton Plant)	mgd	21.0	21.6	19.4	20.2	22.0	20.1	19.2	18.9	20.8
	Tidal Pool Water	mgd	0.0	3.0	6.5	5.2	0.0	0.0	0.0	0.0	0.0
Chlorides	Raw Chlorides(Stanton Plt)	ppm	26.0	40.0	30.0	96.0	20.5	29.0	28.0	25.0	25.0
	TCS	ppm	29.0	107.0	125.0	58.0	52.0	46.0	37.0	40.0	32.0

Projected Availability for Stanton Plant

Chloride Data	Estimated Stream Chlorides	ppm	40.0	40.0	40.0	40.0	40.0	40.0	30.0	40.0	40.0
	Maximum Chloride	ppm	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0
Flow Data	Output Required	mgd	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6
	Stream Supply	mgd	47.4	18.6	12.9	15.0	313.8	53.8	24.9	96.6	61.8
Combined Flow Data	Maximum Tidal Water	mgd	0.0	12.0	12.0	12.0	0.0	0.0	0.0	0.0	0.0
	MaxTidal+Stream Supply	mgd	47.4	30.6	24.9	27.0	313.8	53.8	24.9	96.6	61.8
	Hoopes Required	mgd	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total Provided	mgd	30.0	30.0	24.9	27.0	30.0	30.0	24.9	30.0	30.0
	Chloride Level Out	ppm	63.2	67.6	81.0	48.0	418.4	71.7	30.0	128.8	82.4
Hoopes	Cumulative Hoopes usage	mg	93.6	93.6	93.6	93.6	93.6	93.6	93.6	93.6	93.6

This table is part of a report entitled "United Water Delaware Source Water Availability Study" and should only be viewed within context of that report

UWDE Source Water Availability Study

Limit Hoopes to 10 mgd

2002 Usage and Chloride Data for

Stanton Plant



Date			9/3/2002	9/4/2002	9/5/2002	9/6/2002	9/7/2002	9/8/2002	9/9/2002	9/10/2002	9/11/2002
WCC	Gage Data	cfs	24.0	18.0	15.0	13.0	13.0	12.0	12.0	11.0	11.0
	Extrapolated	cfs	27.8	20.9	17.4	15.1	15.1	13.9	13.9	12.8	12.8
		mgd	18.0	13.5	11.3	9.8	9.8	9.0	9.0	8.3	8.3
RCC	Gage Data	cfs	16.0	13.0	12.0	10.0	9.5	10.0	10.0	9.1	8.4
		mgd	10.4	8.4	7.8	6.5	6.1	6.5	6.5	5.9	5.4
	Hoopes	mgd	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Cumulative Hoopes usage	mg	129.7	129.7	129.7	129.7	129.7	129.7	129.7	129.7	129.7
	RCC - Hoopes	mgd	10.4	8.4	7.8	6.5	6.1	6.5	6.5	5.9	5.4
	Extrapolated	mgd	10.7	8.7	8.0	6.7	6.3	6.7	6.7	6.1	5.6
Combined	WCC+RCC-Hoopes	mgd	28.7	22.2	19.3	16.4	16.1	15.7	15.7	14.3	13.9
	Output (Stanton Plant)	mgd	21.2	18.8	19.3	19.1	16.7	16.9	18.6	19.1	18.9
	Tidal Pool Water	mgd	0.0	0.0	0.0	2.7	0.6	1.2	2.9	4.8	5.0
Chlorides	Raw Chlorides(Stanton Ph)	ppm	33.0	26.0	35.0	29.0	27.0	30.0	32.0	45.0	118.0
	TCS	ppm	36.0	32.0	36.0	34.0	35.0	42.0	225.0	250.0	260.0

Projected Availability for Stanton Plant

Chloride Data	Estimated Stream Chlorides	ppm	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
	Maximum Chloride	ppm	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0
Flow Data	Output Required	mgd	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6
	Stream Supply	mgd	28.7	22.2	19.3	16.4	16.1	15.7	15.7	14.3	13.9
Combined Flow Data	Maximum Tidal Water	mgd	0.0	0.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
	MaxTidal+Stream Supply	mgd	28.7	22.2	31.3	28.4	28.1	27.7	27.7	26.3	25.9
	Hoopes Required	mgd	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total Provided	mgd	28.7	22.2	30.0	28.4	28.1	27.7	27.7	26.3	25.9
	Chloride Level Out	ppm	40.0	40.0	40.1	37.5	37.9	40.9	120.2	135.7	142.1
Hoopes	Cumulative Hoopes usage	mg	93.6	93.6	93.6	93.6	93.6	93.6	93.6	93.6	93.6

This table is part of a report entitled "United Water Delaware Source Water Availability Study" and should only be viewed within context of that report

UWDE Source Water Availability Study

Limit Hoopes to 10 mgd

2002 Usage and Chloride Data for

Stanton Plant



Date			9/12/2002	9/13/2002	9/14/2002	9/15/2002
WCC	Gage Data	cfs	9.0	8.7	9.3	11.0
	Extrapolated	cfs	10.4	10.1	10.8	12.8
		mgd	6.8	6.5	7.0	8.3
RCC	Gage Data	cfs	7.3	11.0	17.0	17.0
		mgd	4.7	7.1	11.0	11.0
	Hoopes	mgd	0.0	5.0	5.0	5.0
	Cumulative Hoopes usage	mg	129.7	134.7	139.7	144.7
	RCC - Hoopes	mgd	4.7	2.1	6.0	6.0
	Extrapolated	mgd	4.9	2.2	6.2	6.2
Combined	WCC+RCC-Hoopes	mgd	11.6	8.7	13.2	14.4
	Output (Stanton Plant)	mgd	16.6	15.7	16.3	16.0
	Tidal Pool Water	mgd	5.0	7.0	0.0	0.0
Chlorides	Raw Chlorides(Stanton Plt)	ppm	210.0	386.0	218.0	48.0
	TCS	ppm	450.0	475.0	280.0	245.0

Projected Availability for Stanton Plant

Chloride Data	Estimated Stream Chlorides	ppm	40.0	40.0	40.0	40.0
	Maximum Chloride	ppm	230.0	230.0	230.0	230.0
Flow Data	Output Required	mgd	20.6	20.6	20.6	20.6
	Stream Supply	mgd	11.6	8.7	13.2	14.4
Combined Flow Data	Maximum Tidal Water	mgd	9.5	9.0	12.0	12.0
	MaxTidal+Stream Supply	mgd	21.2	17.7	25.2	26.4
	Hoopes Required	mgd	0.0	2.9	0.0	0.0
	Total Provided	mgd	21.2	20.6	25.2	26.4
	Chloride Level Out	ppm	224.9	230.0	154.5	133.1
Hoopes	Cumulative Hoopes usage	mg	93.6	96.5	96.5	96.5

This table is part of a report entitled "United Water Delaware Source Water Availability Study" and should only be viewed within context of that report

APPENDIX B

PROJECTED AVAILABILITY FOR CHRISTIANA PLANT

UWDE Source Water Availability Study



Projected Availability for Christina Plant

Date		7/1/2002	7/2/2002	7/3/2002	7/4/2002	7/5/2002	7/6/2002	7/7/2002	7/8/2002
Christina Gage Flow	cfs	3.40	3.30	3.30	3.30	3.20	2.90	2.60	2.40
Christiana Plant	cfs	7.58	7.36	7.36	7.36	7.14	6.47	5.80	5.35
	mgd	4.91	4.76	4.76	4.76	4.62	4.18	3.75	3.46
Well Allocation	mgd	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Combined Christina & Well	mgd	5.16	5.01	5.01	5.01	4.87	4.43	4.00	3.71
Smalley's Pond Rqd	mgd								
Cum. Smalley's Pond Rqd	mg								

Projected Tidal Usage at Smalley's Pond

Supplemental Tidal Pumping	mgd								
Cumulative Tidal Pumping	mg								
Net Volume Loss in Smalleys	mg								

Legend:

Christina Gage Flow - Daily mean streamflows recorded by USGS for Christina River at Coochs Bridge, DE

Christina Plant - Flow at Christina Plant (increased due to increase in watershed size from Coochs Bridge).

Smalley's Pond Rqd - Total flow required from Smalley's to reach the output required

Cum. Smalley's Pond Rqd - Cumulative amount of water needed from Smalley's Pond in consecutive days to maintain 3.25 mgd output until recharge event

Supplemental Tidal Pumping - Amount of tidal water to be pumped over dam

Cumulative Tidal Pumping - Total volume of tidal water pumped over dam

Net Volume Loss in Smalley's - Total volume lost in Smalley's Pond (Includes volume gained from pumping tidal water).

This table is part of a report entitled "United Water Delaware Source Water Availability Study" and should only be viewed within context of that report

UWDE Source Water Availability Study



Projected Availability for Christina Plant

Date		7/9/2002	7/10/2002	7/11/2002	7/12/2002	7/13/2002	7/14/2002	7/15/2002	7/16/2002
Christina Gage Flow	cfs	5.40	19.00	3.80	2.90	2.80	3.90	3.50	3.00
Christiana Plant	cfs	12.04	42.37	8.47	6.47	6.24	8.70	7.81	6.69
	mgd	7.79	27.41	5.48	4.18	4.04	5.63	5.05	4.33
Well Allocation	mgd	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Combined Christina & Well	mgd	8.04	27.66	5.73	4.43	4.29	5.88	5.30	4.58
Smalley's Pond Rqd	mgd								
Cum. Smalley's Pond Rqd	mg								

Projected Tidal Usage at Smalley's Pond

Supplemental Tidal Pumping	mgd								
Cumulative Tidal Pumping	mg								
Net Volume Loss in Smalleys	mg								

Legend:

Christina Gage Flow - Daily mean streamflows recorded by USGS for Christina River at Coochs Bridge, DE

Christina Plant - Flow at Christina Plant (increased due to increase in watershed size from Coochs Bridge).

Smalley's Pond Rqd - Total flow required from Smalley's to reach the output required

Cum. Smalley's Pond Rqd - Cumulative amount of water needed from Smalley's Pond in consecutive days to maintain 3.25 mgd output until recharge event

Supplemental Tidal Pumping - Amount of tidal water to be pumped over dam

Cumulative Tidal Pumping - Total volume of tidal water pumped over dam

Net Volume Loss in Smalley's - Total volume lost in Smalley's Pond (Includes volume gained from pumping tidal water).

This table is part of a report entitled "United Water Delaware Source Water Availability Study" and should only be viewed within context of that report

UWDE Source Water Availability Study



Projected Availability for Christiana Plant

Date		7/17/2002	7/18/2002	7/19/2002	7/20/2002	7/21/2002	7/22/2002	7/23/2002	7/24/2002
Christina Gage Flow	cfs	2.80	2.50	2.30	2.30	2.30	2.20	3.20	6.80
Christiana Plant	cfs	6.24	5.58	5.13	5.13	5.13	4.91	7.14	15.16
	mgd	4.04	3.61	3.32	3.32	3.32	3.17	4.62	9.81
Well Allocation	mgd	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Combined Christina & Well	mgd	4.29	3.86	3.57	3.57	3.57	3.42	4.87	10.06
Smalley's Pond Rqd	mgd								
Cum. Smalley's Pond Rqd	mg								

Projected Tidal Usage at Smalley's Pond

Supplemental Tidal Pumping	mgd								
Cumulative Tidal Pumping	mg								
Net Volume Loss in Smalleys	mg								

Legend:

Christina Gage Flow - Daily mean streamflows recorded by USGS for Christina River at Coochs Bridge, DE

Christina Plant - Flow at Christina Plant (increased due to increase in watershed size from Coochs Bridge).

Smalley's Pond Rqd - Total flow required from Smalley's to reach the output required

Cum. Smalley's Pond Rqd - Cumulative amount of water needed from Smalley's Pond in consecutive days to maintain 3.25 mgd output until recharge event

Supplemental Tidal Pumping - Amount of tidal water to be pumped over dam

Cumulative Tidal Pumping - Total volume of tidal water pumped over dam

Net Volume Loss in Smalley's - Total volume lost in Smalley's Pond (Includes volume gained from pumping tidal water).

This table is part of a report entitled "United Water Delaware Source Water Availability Study" and should only be viewed within context of that report

UWDE Source Water Availability Study



Projected Availability for Christiana Plant

Date		7/25/2002	7/26/2002	7/27/2002	7/28/2002	7/29/2002	7/30/2002	7/31/2002	8/1/2002
Christina Gage Flow	cfs	2.70	2.30	2.30	3.00	3.10	2.40	2.30	2.40
Christiana Plant	cfs	6.02	5.13	5.13	6.69	6.91	5.35	5.13	5.35
	mgd	3.90	3.32	3.32	4.33	4.47	3.46	3.32	3.46
Well Allocation	mgd	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Combined Christina & Well	mgd	4.15	3.57	3.57	4.58	4.72	3.71	3.57	3.71
Smalley's Pond Rqd	mgd								
Cum. Smalley's Pond Rqd	mg								

Projected Tidal Usage at Smalley's Pond

Supplemental Tidal Pumping	mgd								
Cumulative Tidal Pumping	mg								
Net Volume Loss in Smalleys	mg								

Legend:

Christina Gage Flow - Daily mean streamflows recorded by USGS for Christina River at Coochs Bridge, DE

Christina Plant - Flow at Christina Plant (increased due to increase in watershed size from Coochs Bridge).

Smalley's Pond Rqd - Total flow required from Smalley's to reach the output required

Cum. Smalley's Pond Rqd - Cumulative amount of water needed from Smalley's Pond in consecutive days to maintain 3.25 mgd output until recharge event

Supplemental Tidal Pumping - Amount of tidal water to be pumped over dam

Cumulative Tidal Pumping - Total volume of tidal water pumped over dam

Net Volume Loss in Smalley's - Total volume lost in Smalley's Pond (Includes volume gained from pumping tidal water).

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UWDE Source Water Availability Study



Projected Availability for Christiana Plant

Date		8/2/2002	8/3/2002	8/4/2002	8/5/2002	8/6/2002	8/7/2002	8/8/2002	8/9/2002
Christina Gage Flow	cfs	3.30	2.20	2.10	1.90	1.60	1.70	1.90	1.50
Christiana Plant	cfs	7.36	4.91	4.68	4.24	3.57	3.79	4.24	3.35
	mgd	4.76	3.17	3.03	2.74	2.31	2.45	2.74	2.16
Well Allocation	mgd	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Combined Christina & Well	mgd	5.01	3.42	3.28	2.99	2.56	2.70	2.99	2.41
Smalley's Pond Rqd	mgd				0.26	0.69	0.55	0.26	0.84
Cum. Smalley's Pond Rqd	mg				0.26	0.95	1.50	1.76	2.59

Projected Tidal Usage at Smalley's Pond

Supplemental Tidal Pumping	mgd					0.50	0.50	0.50	0.50
Cumulative Tidal Pumping	mg					0.50	1.00	1.50	2.00
Net Volume Loss in Smalleys	mg						0.50	0.26	0.59

Legend:

Christina Gage Flow - Daily mean streamflows recorded by USGS for Christina River at Coochs Bridge, DE

Christina Plant - Flow at Christina Plant (increased due to increase in watershed size from Coochs Bridge).

Smalley's Pond Rqd - Total flow required from Smalley's to reach the output required

Cum. Smalley's Pond Rqd - Cumulative amount of water needed from Smalley's Pond in consecutive days to maintain 3.25 mgd output until recharge event

Supplemental Tidal Pumping - Amount of tidal water to be pumped over dam

Cumulative Tidal Pumping - Total volume of tidal water pumped over dam

Net Volume Loss in Smalley's - Total volume lost in Smalley's Pond (Includes volume gained from pumping tidal water).

This table is part of a report entitled "United Water Delaware Source Water Availability Study" and should only be viewed within context of that report

UWDE Source Water Availability Study



Projected Availability for Christina Plant

Date		8/10/2002	8/11/2002	8/12/2002	8/13/2002	8/14/2002	8/15/2002	8/16/2002	8/17/2002
Christina Gage Flow	cfs	1.30	1.20	1.10	1.00	1.00	1.10	1.10	1.30
Christiana Plant	cfs	2.90	2.68	2.45	2.23	2.23	2.45	2.45	2.90
	mgd	1.88	1.73	1.59	1.44	1.44	1.59	1.59	1.88
Well Allocation	mgd	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Combined Christina & Well	mgd	2.13	1.98	1.84	1.69	1.69	1.84	1.84	2.13
Smalley's Pond Rqd	mgd	1.12	1.27	1.41	1.56	1.56	1.41	1.41	1.12
Cum. Smalley's Pond Rqd	mg	3.72	4.98	6.40	7.95	9.51	10.93	12.34	13.46

Projected Tidal Usage at Smalley's Pond

Supplemental Tidal Pumping	mgd	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Cumulative Tidal Pumping	mg	2.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00
Net Volume Loss in Smalleys	mg	1.22	1.98	2.90	3.95	5.01	5.93	6.84	7.46

Legend:

Christina Gage Flow - Daily mean streamflows recorded by USGS for Christina River at Coochs Bridge, DE

Christina Plant - Flow at Christina Plant (increased due to increase in watershed size from Coochs Bridge).

Smalley's Pond Rqd - Total flow required from Smalley's to reach the output required

Cum. Smalley's Pond Rqd - Cumulative amount of water needed from Smalley's Pond in consecutive days to maintain 3.25 mgd output until recharge event

Supplemental Tidal Pumping - Amount of tidal water to be pumped over dam

Cumulative Tidal Pumping - Total volume of tidal water pumped over dam

Net Volume Loss in Smalley's - Total volume lost in Smalley's Pond (Includes volume gained from pumping tidal water).

UWDE Source Water Availability Study



Projected Availability for Christina Plant

Date		8/18/2002	8/19/2002	8/20/2002	8/21/2002	8/22/2002	8/23/2002	8/24/2002	8/25/2002
Christina Gage Flow	cfs	1.30	1.20	1.10	1.10	1.10	1.50	38.00	14.00
Christiana Plant	cfs	2.90	2.68	2.45	2.45	2.45	3.35	84.74	31.22
	mgd	1.88	1.73	1.59	1.59	1.59	2.16	54.83	20.20
Well Allocation	mgd	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Combined Christina & Well	mgd	2.13	1.98	1.84	1.84	1.84	2.41	55.08	20.45
Smalley's Pond Rqd	mgd	1.12	1.27	1.41	1.41	1.41	0.84		
Cum. Smalley's Pond Rqd	mg	14.59	15.86	17.27	18.68	20.09	20.93		

Projected Tidal Usage at Smalley's Pond

Supplemental Tidal Pumping	mgd	0.50	0.50	0.50	0.50	0.50	0.50		
Cumulative Tidal Pumping	mg	6.50	7.00	7.50	8.00	8.50	9.00		
Net Volume Loss in Smalleys	mg	8.09	8.86	9.77	10.68	11.59	11.93		

Legend:

Christina Gage Flow - Daily mean streamflows recorded by USGS for Christina River at Coochs Bridge, DE

Christina Plant - Flow at Christina Plant (increased due to increase in watershed size from Coochs Bridge).

Smalley's Pond Rqd - Total flow required from Smalley's to reach the output required

Cum. Smalley's Pond Rqd - Cumulative amount of water needed from Smalley's Pond in consecutive days to maintain 3.25 mgd output until recharge event

Supplemental Tidal Pumping - Amount of tidal water to be pumped over dam

Cumulative Tidal Pumping - Total volume of tidal water pumped over dam

Net Volume Loss in Smalley's - Total volume lost in Smalley's Pond (Includes volume gained from pumping tidal water).

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UWDE Source Water Availability Study



Projected Availability for Christiana Plant

Date		8/26/2002	8/27/2002	8/28/2002	8/29/2002	8/30/2002	8/31/2002	9/1/2002	9/2/2002
Christina Gage Flow	cfs	3.80	2.60	4.00	131.00	6.90	3.60	72.00	16.00
Christiana Plant	cfs	8.47	5.80	8.92	292.13	15.39	8.03	160.56	35.68
	mgd	5.48	3.75	5.77	189.01	9.96	5.19	103.88	23.08
Well Allocation	mgd	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Combined Christina & Well	mgd	5.73	4.00	6.02	189.26	10.21	5.44	104.13	23.33
Smalley's Pond Rqd	mgd								
Cum. Smalley's Pond Rqd	mg								

Projected Tidal Usage at Smalley's Pond

Supplemental Tidal Pumping	mgd								
Cumulative Tidal Pumping	mg								
Net Volume Loss in Smalleys	mg								

Legend:

Christina Gage Flow - Daily mean streamflows recorded by USGS for Christina River at Coochs Bridge, DE

Christina Plant - Flow at Christina Plant (increased due to increase in watershed size from Coochs Bridge).

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Supplemental Tidal Pumping - Amount of tidal water to be pumped over dam

Cumulative Tidal Pumping - Total volume of tidal water pumped over dam

Net Volume Loss in Smalley's - Total volume lost in Smalley's Pond (Includes volume gained from pumping tidal water).

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UWDE Source Water Availability Study



Projected Availability for Christina Plant

Date		9/3/2002	9/4/2002	9/5/2002	9/6/2002	9/7/2002	9/8/2002	9/9/2002	9/10/2002
Christina Gage Flow	cfs	4.80	3.70	3.20	2.80	2.50	2.30	2.30	2.30
Christiana Plant	cfs	10.70	8.25	7.14	6.24	5.58	5.13	5.13	5.13
	mgd	6.93	5.34	4.62	4.04	3.61	3.32	3.32	3.32
Well Allocation	mgd	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Combined Christina & Well	mgd	7.18	5.59	4.87	4.29	3.86	3.57	3.57	3.57
Smalley's Pond Rqd	mgd								
Cum. Smalley's Pond Rqd	mg								

Projected Tidal Usage at Smalley's Pond

Supplemental Tidal Pumping	mgd								
Cumulative Tidal Pumping	mg								
Net Volume Loss In Smalleys	mg								

Legend:

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Net Volume Loss In Smalley's - Total volume lost in Smalley's Pond (Includes volume gained from pumping tidal water).

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UWDE Source Water Availability Study



Projected Availability for Christiana Plant

Date		9/11/2002	9/12/2002	9/13/2002	9/14/2002	9/15/2002
Christina Gage Flow	cfs	2.30	2.20	2.00	1.90	1.90
Christiana Plant	cfs	5.13	4.91	4.46	4.24	4.24
	mgd	3.32	3.17	2.89	2.74	2.74
Well Allocation	mgd	0.25	0.25	0.25	0.25	0.25
Combined Christina & Well	mgd	3.57	3.42	3.14	2.99	2.99
Smalley's Pond Rqd	mgd			0.11	0.26	0.26
Cum. Smalley's Pond Rqd	mg			0.11	0.37	0.63

Projected Tidal Usage at Smalley's Pond

Supplemental Tidal Pumping	mgd					0.50
Cumulative Tidal Pumping	mg					0.50
Net Volume Loss in Smalleys	mg					0.13

Legend:

Christina Gage Flow - Daily mean streamflows recorded by USGS for Christina River at Coochs Bridge, DE

Christina Plant - Flow at Christina Plant (increased due to increase in watershed size from Coochs Bridge).

Smalley's Pond Rqd - Total flow required from Smalley's to reach the output required

Cum. Smalley's Pond Rqd - Cumulative amount of water needed from Smalley's Pond in consecutive days to maintain 3.25 mgd output until recharge event

Supplemental Tidal Pumping - Amount of tidal water to be pumped over dam

Cumulative Tidal Pumping - Total volume of tidal water pumped over dam

Net Volume Loss in Smalley's - Total volume lost in Smalley's Pond (Includes volume gained from pumping tidal water).

This table is part of a report entitled "United Water Delaware Source Water Availability Study" and should only be viewed within context of that report



June 21, 2006

Nancy Trushell, P.E.
United Water Delaware
2000 First State Boulevard
P.O. Box 6508
Wilmington, DE 19804-6508

RE: Project No. 5363.CD
United Water Delaware
Christiana Water Treatment Plant
Pumping Test

Dear Ms. Trushell:

In response to your earlier request, Duffield Associates recently completed a pumping test on the production well at the Christiana Water Treatment Plant. The objective of the test was to confirm the capacity of the well relative to earlier testing and production data. The following information briefly summarizes the results of our testing.

The Christiana production well is 306 feet deep, screened in two intervals (215 to 239 ft and 275 to 306 ft), and has been used intermittently in the past to augment water supply for the plant. The well was constructed in 1968, with tests indicating a yield of approximately 250 gpm. The well was video logged and re-developed in 1995. Video logging in 1995 indicated minor encrustation on the solid riser but not on the stainless steel screen. The well currently is permitted by the Delaware River Basin Commission for withdrawal of no more than 288,000 gallons per day (gpd).

Duffield Associates performed an abbreviated pumping test of the production well on May 22, 2006. Water levels were manually monitored in the pumping well. The adjacent previously installed ASR testing well, located approximately 150 feet from the pumping well, was used as an observation well and monitored both manually and with an automatic data logger.

The well was pumped at 175 gallons per minute (gpm) for a period of two hours, yielding a drawdown of approximately 80 feet. The pumping rate was increased to 200 gpm and the test continued for 22 additional hours, yielding drawdown of approximately 135 feet. Drawdown stabilized, during the later stages of the pumping tests, with only six (6) feet of drawdown in the last eight (8) hours of testing and with less than one (1) foot of drawdown in the last two (2) hours of the testing. Data was further analyzed to calculate the well's Specific Capacity and estimate aquifer properties. Specific Capacity was determined to be 1.48 gallons per minute per foot of drawdown (gpm/ft) during the May 22, 2006, pumping test, as compared to a specific capacity of 1.1 gpm/ft realized during a six (6) hour step drawdown pumping test conducted by

Nancy Trushell, P.E.
RE: Project No. 5363.CD
June 21, 2006
Page 2



Duffield Associates in 1995. The Transmissivity (T) was estimated based upon an empirical relationship between T and Specific Capacity developed by Razack and Huntley (1991), resulting in a value of 1,481.3 ft²/day. It should be noted that this estimate was calculated from a short duration pumping test and may not accurately reflect the true aquifer properties.

The recent testing and computed parameters are comparable to prior tests performed on the production well. Based upon this short term testing, the well appears to be capable of sustaining a pumping rate of approximately 200 gpm (288,000 gpd) for an extended period. This production is consistent with the DRBC allocation.

Please review the enclosed findings. If you have any questions concerning the data or analyses, please do not hesitate to contact us at 302-239-6634.

Very truly yours,

DUFFIELD ASSOCIATES, INC.

A handwritten signature in black ink, appearing to read 'Gary W. Snyder', written over the company name.

Gary W. Snyder, P.E., P.G.
Water Resources Group Leader

GWS:bac
WORD\5636CD.0606-UWD TREATMENT PLANT.COR

Exhibit 13

**Exhibit 13
Draft Report of Investigations by
CH2M HILL**

Draft Report of Investigations of the Aquifer Storage and Recovery Test Well Program at the Saint George's Crossing Test Site, Delaware City, Delaware

Prepared for
United Water Delaware

Wilmington, Delaware

February, 2006



CH2MHILL

1700 Market Street
Suite 1600
Philadelphia, PA 19103-3916



CH2M HILL
1700 Market Street
Suite 1600
Philadelphia, PA 19103-3916

February 9, 2006

161679.D0.05

Nancy J. Trushell, P.E.
Engineering Manager
United Water Delaware
2000 First State Boulevard
Wilmington, DE 19804-0508

Subject: Submission of Draft Report of Investigations of the Aquifer Storage and Recovery
Test Well Program at the Saint George's Crossing Test Site, Delaware
City, Delaware

Dear Ms. Trushell:

Please find attached for your review five copies of the Draft Report of Investigations of the Aquifer Storage and Recovery Test Well Program at the Saint George's Crossing Test Site, Delaware City, Delaware. The report describes field activities and the evaluation of the feasibility of utilizing the Saint George's Crossing site for an aquifer storage and recovery (ASR) facility.

Results of the test program were favorable for the implementation of ASR at the site. A full-sized, ASR well screened in the Lower Potomac Aquifer should display a recovery capacity exceeding 1,000 gallons per minute. Native groundwater quality was good with the exception of moderately elevated concentrations of iron. Finished water from the UWDE system exhibited excellent chemical characteristics for an ASR recharge water including near-saturated concentrations of dissolved oxygen, a neutral pH with moderate buffer capacity, and mildly elevated concentrations of chloride which serves as a conservative tracer.

The only concern identified during the investigation was elevated turbidity in water produced during the aquifer test program. Elevated turbidity appeared to originate from the abbreviated pumping development schedule and aggressive screen interval selection inherent to test well construction. Before embarking on a full-scale ASR test program at the site, the origin of the turbidity should be investigated with a period of overpumping development on TW-1, followed by a short pumping test. Time-related turbidity measurements will be collected during the pumping test.

Nancy J. Trushell, P.E.

Page 2

February 9, 2006

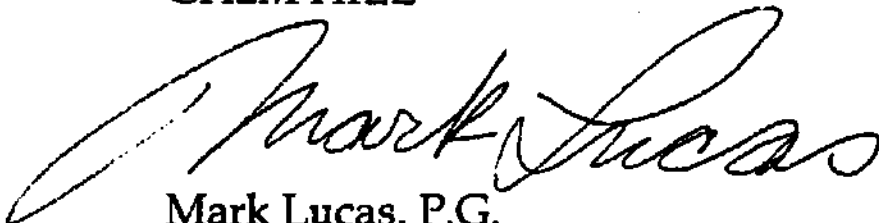
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Please provide review comments from the United Water Delaware (UWDE) staff in the most convenient manner to yourself. CH2M HILL will integrate the comments into a final report and submit 10 copies to UWDE within 5 working days of receiving the comments.

If you have any questions or concerns, please do not hesitate to contact me at (215) 563-4220. We look forward to continuing work on this important project.

Sincerely,

CH2M HILL



Mark Lucas, P.G.

Project Manager

PHL/UWDELETSTGEORGEDRAFTREPCOV_02092006.doc

c: Ted Harris, P.E./UWDE
Kenneth McGill, PG/CH2M HILL
Evan Costas/CH2M HILL

Executive Summary

A test program was conducted at the St. George's Crossing Test Site to assess the site's suitability as a potential aquifer storage and recovery (ASR) facility. Important elements of the test program involved assessing the production capacity and water quality of the Lower Potomac Aquifer, characterizing hydraulic coefficients and water quality from individual sand zones in the aquifer, and characterizing water quality from the United Water Delaware (UWDE) system and its applicability to ASR at the site.

Field Methods

The field portion of the test program extended from September through December 2005. Field activities included drilling of a 773-foot pilot boring, installation and development of an 8-inch diameter test well (TW-1), and conducting a comprehensive aquifer test program. The aquifer testing program involved a conventional testing schedule including an extensive background monitoring period, a step drawdown test, a 24-hour constant rate test, and packer testing. Pumping data was obtained from the Valero production wells to evaluate potentiometric elevations at TW-1 during the background period and pumping tests. Packer tests were conducted in each of the four sand units of the Lower Potomac Aquifer.

Important field chemistry parameters (temperature, pH, specific conductivity, Eh, dissolved oxygen (DO), carbon dioxide, ferrous iron, and total iron) were measured during the step drawdown test, the 24-hour aquifer test, and the packer tests. Measurements were intended to establish water quality with pumping rate, pumping time, and in individual zones of the Lower Potomac Aquifer. Water quality samples were submitted for laboratory analysis from the end of the 24-hour aquifer test, and each of the four packer tests.

Results of Investigation

Geology

The St. George's Crossing Test Site is primarily underlain by three stratigraphic units: the Columbia Formation, the Merchantville Formation, and the Potomac Formation. Together, these units make up approximately 750 feet of unconsolidated sediment. The Columbia Formation appears as a dark, yellowish-orange, fine gravel and coarse sand layer from the ground surface to a depth of approximately 75 feet below the ground surface (BGS). The Merchantville Formation appears as a dark gray clay and silt mixture with occasional traces of fine gravel and sand. The unit extends from 75 to 135 feet BGS. The Potomac Formation is characterized by predominantly dark gray, red, and white clays as well as gray-brown fluvial sands. The Potomac Formation comprised most of the overburden section and was encountered from 135 feet to approximately 750 feet.

The Potomac Formation lies on top of weathered crystalline rock. Because of the time lag inherent with collection of mud rotary samples, distinguishing between bedrock and fine-

grained unconsolidated sediments at this depth was difficult. Actual cuttings attached to the bit consisted of blue and gray clays that could represent weathered bedrock.

Hydrogeology

Aquifer zones were identified in the Columbia and Potomac Formations. The Columbia Aquifer comprises the water table aquifer at this locale. Two major, confined aquifers occur in the Potomac Formation at the top and base of the formation, and appear correlative to the Upper and Lower Potomac Aquifers in the area.

The effective sand thickness of the Lower Potomac Aquifer, the ASR storage aquifer, was 145 feet, discounting thin clay beds. Average static water levels in the Lower Potomac Aquifer at TW-1 were around 202 feet BGS, equivalent to an elevation of -160 feet mean sea level (MSL). Specific capacity values for TW-1 from the step drawdown test averaged 9.20 gpm/ft at pumping rates approaching up to 535 gallons per minute (gpm). Data from the 24-hour constant rate aquifer test indicates that the Lower Potomac Aquifer exhibits an average transmissivity of 2955 ft²/day with a storage coefficient of 1.2×10^{-3} .

Packer testing results indicated that Zone 2, although the thinnest sand unit, was the most productive zone with a specific capacity of 10.98 gpm/ft and a unit specific capacity per foot of 0.549. Zone 1 was slightly less productive, while Zones 3 and 4 were both poor by comparison with specific capacities averaging less than 2 gpm/ft. Zones 1 and 2 exhibited an average transmissivity of 3617 ft²/day, while Zones 3 and 4 displayed an average value of 685 ft²/day.

Packer testing also showed that Zones 1 and 2, and Zones 3 and 4 were hydraulically connected. Conversely, Zones 1 and 2 were isolated from Zones 3 and 4. The head distribution observed during the packer testing suggests that the Lower Potomac Aquifer is separated into two, discrete hydrologic intervals. One interval extends from 560 to 665 feet BGS, and the second interval occurs at 680 to 755 feet BGS.

Water Quality

With the exception of elevated iron concentrations and turbidity, water quality from the Lower Potomac Aquifer was good with low concentrations of TDS and chlorides, and a neutral pH. Total iron concentrations were significantly elevated above the Federal Drinking Water Standard (FDWS) at 2.8 mg/L. Total and dissolved iron concentrations were roughly equivalent, indicating iron was in equilibrium with a mineral phase in the aquifer. Ferrous iron concentrations ranged from 1.3 to 2.0 mg/L.

To stabilize iron bearing minerals in the Lower Potomac Aquifer during ASR operations, the pH of the recharge water should be adjusted from 7.2 to 8.3 with NaOH. Hydroxyl ions, with the elevated DO in the recharge water, will react with surfaces on iron bearing minerals to form isolating films and precipitates. These coverings isolate the iron bearing mineral from further reaction with the aquifer environment, and are sorptive of any metal ions migrating toward the ASR well. Adjusting the pH of the recharge water from 7.2 to 8.3 will require the addition of 8 mg/L of sodium hydroxide.

Turbidity levels exceeded 10 NTU during the step drawdown, 24 hour constant rate aquifer test, and packer testing, but declined progressively with each test. Elevated turbidity levels

appeared to be a function of incomplete pumping development, and the relatively aggressive screen interval selection inherent to test well construction.

Native groundwater from the Lower Potomac Aquifer was a sodium bicarbonate type transitional between sodium-chloride, connate water and calcium- bicarbonate type recharge water. Finished water from the UWDE system exhibits greater chloride and total dissolved solids (TDS) concentrations than the native groundwater. UWDE finished water exhibits excellent characteristics for a recharge water with elevated DO concentrations, a neutral pH with moderate buffering capacity, and concentrations of the natural tracer, chloride, significantly above the native groundwater concentrations.

Thermodynamic equilibrium modeling indicates native groundwater is in equilibrium with quartz, the main mineralogical component of the Lower Potomac Aquifer and siderite, an iron carbonate mineral. Saturated indices of other silica minerals suggest that feldspars are being attacked by acids and degrading to aluminum silicates and hydroxide minerals like gibbsite. Clay minerals in the aquifer should consist primarily of kaolinite and illite.

Groundwater flow modeling

Groundwater flow modeling indicates that the recharge water volume totaling 225 million gallons (MG) and stored through two or three ASR wells at the Saint George's Crossing Site will not be intercepted by local Valero production wells screened in the Lower Potomac Aquifer.

Although some deformation of the storage bubbles occurs during modeling simulations, most of the recharge water will be recovered before native groundwater enters the ASR wells. The modeled amount of native groundwater entering the ASR wells is consistent with other ASR sites in the Atlantic Coastal Plain and should influence aquifer conditioning during ASR operations.

ASR Facility Conceptual Design

A full size ASR well screened in the Lower Potomac Aquifer should be capable of 1,050 gpm. Thus, two ASR wells could meet UWDE's target recovery capacity of 3.0 million gallons per day (MGD). However, given a required storage volume of 225 MGD, a three well ASR facility would be more effective, less prone to plugging, and require less maintenance at the Saint George's Crossing Site. Consequently, for planning purposes, a three well facility has been evaluated and subjected to cost estimates.

A treatment plant at the Saint George's Crossing Site would contain chemical feed systems for disinfection and pH adjustment. A large diameter pipe would be installed to obtain chlorine detention time. The maximum estimated budget level (plus 30 percent, minus 15 percent accuracy) costs including contractor's profit mobilization and contingency for a three well ASR facility would approach \$3,600,000 with a total present worth cost for the project considering 20 years of operations and maintenance at \$5,905,000.

Recommendations

Given the results of the testing program, implementation of an ASR facility at the Saint George's Crossing Site appears promising. Hydraulic characteristics of the Lower Potomac Aquifer are excellent in comparison to other areas of northern New Castle County, and even the adjacent Valero facility. A full size ASR well screened in the Lower Potomac Aquifer should be capable of recovering stored water at a rate of around 1,000 gpm. With a static water level of greater than 200 feet below grade, a significant amount of head is available for recharge operations. Conversely, with the depth to the top of the Lower Potomac Aquifer at 560 feet below grade, sufficient hydraulic head is available for pumping.

Valero maintains up to six wells in the Lower Potomac Aquifer with the closest production well (P-9A) lying less than 3,000 feet from the Saint George's Crossing Site. However, results of groundwater flow modeling indicate that the recharge volume from two or three ASR storage bubbles will not be intercepted by local pumping wells over a normal, seasonal recharge/recovery cycle.

Native groundwater quality in the Lower Potomac Aquifer is good for ASR purposes. Iron concentrations are only moderately elevated, and should be easily controlled by aquifer conditioning during ASR operations. UWDE's finished distribution water also displays excellent characteristics for ASR purposes with near-saturated concentrations of DO, a neutral pH with moderate buffer capacity, and concentrations of the natural conservative tracer, chloride, ranging up to five times the concentration in groundwater.

The only drawback identified from the test program was elevated turbidity levels in the native groundwater. Turbidity levels appeared to be a function of abbreviated pumping development, and the aggressive screen interval selection inherent to test well construction. Turbidity levels declined over the aquifer testing program (step drawdown test, 24-hour aquifer test, and packer testing), consistent with an incompletely developed well. However, turbidity cannot be routinely discounted if encountered during ASR testing. The origin of the turbidity should be addressed before initiating construction activities at the Saint George's Crossing Site.

Given the results of the testing program at the Saint George's Crossing Site, CH2M HILL recommends that UWDE should proceed with construction of a full-size ASR facility. Although a two-well facility may be feasible, considering a storage volume of 225 MG is required, and the test well exhibited a specific capacity less the 10 gpm, a three well facility will offer greater benefits in regard to recharge operations and maintenance, and should be considered the model for planning purposes. Construction of the ASR facility should proceed with a single well located at the Saint George's Crossing Site.

Before proceeding with construction and ASR testing, TW-1 should undergo up to 10 days of pumping development to ensure that turbidity encountered during the test program originated because the abbreviated pumping development and was not an indication of clay minerals in transition in the Lower Potomac Aquifer. After up to 10 days of pumping development with a vertical, line shaft turbine, a four hour pumping test should be performed for the purpose of measuring turbidity levels with pumping time. Turbidity levels should decline below 5 NTU within 60 minutes of beginning pumping.

Exhibit 14

**Exhibit 14
Consumer Water
Conservation Plan**

UNITED WATER DELAWARE

Consumer Water Conservation Plan 2006-2009

June 15, 2006

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INTRODUCTION

Conservation is a focal point at United Water Delaware (UWD). The UWD website, conservation-minded billing inserts, plant tours, and residential conservation rate structure are some of the ways that United Water currently promotes conservation awareness in the communities that it serves.

This Consumer Water Conservation Plan will describe the current practices in our organization and the added measures that we will take to continue the consumer awareness of, and participation in, water conservation.

The summary below highlights the programs, services, and practices that are currently in place at United Water, with a summary of planned efforts for the future.

- ◆ **Water Conservation Rates.**
- ◆ **Distribution of Water Saver Kits and leak detection tablets.**
- ◆ **Public Awareness and Communication.**
- ◆ **Water Treatment Plant tours and Speaker's Bureau (Education).**
- ◆ **Water Services - Field Service and Home Services.**
- ◆ **System Leak Detection.**

Some of the programs and services currently at United Water Delaware have been in place for a number of years.

Our direction for the future is to be the example, raise awareness of conservation, step up our conservation communications, and take our place as a strong contributing asset to our community. Programs that we anticipate completing in 2006 include:

- ◆ **Installation of a rain garden at the Customer Service Office.**
- ◆ **Planting of drought resistant landscaping and development of a customer self-guided tour.**
- ◆ **Increased communication with customers.**
- ◆ **Heightened public presence.**
- ◆ **Installation of an evapotranspiration weather station.**

Conservation must be a part of our every day routine. Over the years, United Water Delaware has developed a good foundation in promoting conservation. Communication is a crucial piece of any successful plan. Our goal, as a water utility, is to go from awareness to participation, information to practice, and from reactive to proactive.

WATER CONSERVATION RATES

Water conservation rates have been in effect at United Water Delaware since January 1, 2005. Since then, residential customers have been billed using an inclining block rate.

The residential rate structure in place today gently promotes conservation by increasing the unit price (per thousand) of water as usage increases. Therefore, the more consumption used by a customer, the more costly the charge will be. The inclining block conservation rate implemented in 2005 was designed to promote the monetary value of conservation and to be revenue neutral for United Water Delaware. At the time of this rate structure change, a communication notice was mailed to customers on December 4, 2004 that highlighted conservation as its focus with the first sentence, "Water is a precious natural resource that we must use wisely."

A comparison of today's current inclining block rate structure with the rate structure proposed in United Water Delaware's request for an increase in water rates demonstrates that United Water Delaware is taking an even stronger stance to encourage water conservation among its residential customers. A comparison of today's rate structure with the proposed structure filed in May 2006 is as follows:

Quarterly Residential Conservation Rate Comparison

<u>Consumption (per 1,000 gallons)</u>	<u>Rate</u>	<u>% Difference</u>	<u>Rate</u>	<u>% Difference</u>
0 - 5,000	\$2.480		\$2.9192	
5,001 - 20,000	\$2.642	+ 6.5%	\$3.6344	+24.5%
Over 20,000	\$3.077	+16.5%	\$5.4516	+50.0%

WATER SAVING DEVICES

Water Saver Kits

United Water Delaware has been distributing water saver kits to its customer's since 1997. Customer Service Representatives have given them to customers that visit the office, they have mailed them to customers that have called the office or those customers who have emailed a request to receive a kit, and they have been given to customers during residential site visits by United Water Delaware Field Service Representatives.

The kit is a great addition to the conservation-conscious household. The kit contains the following items:

- ◆ Leak detection kit and tablets
- ◆ Water Faucet Aerator
- ◆ Toilet Tank Bank

The leak detection kits also provide customers with tips on checking their home for leaks. The tips start by having customers become aware of using their meter reading to check for leaks and runs through having them check their toilets for leaks using the leak detection tablets (dye tablets). There is a chart included in the kit that illustrates the total potential loss of water in a months time from dripping or leaking fixtures.

The water faucet aerator included in the water saver kit reduces flow from the faucet by two gallons a minute. This can cut the average usage from that faucet in half. The use of the water faucet aerator can also save energy by reducing the amount of hot water used.

The toilet tank bank is a bag that is filled with water and then placed in the toilet tank. The tank bank displaces water in the tank so that when the tank refills, it reduces the number of gallons of water that are used per flush.

These water saver kits help customers conserve water and energy, which provides them with savings on their water, electric or gas bills.

Leak Detection Kits/Tablets

For customers in newer homes that may already have the latest water saving devices and faucets, United Water Delaware offers Leak Detection Kits and Leak Detection Tablets, a smaller version of the Water Saver Kits.

PUBLIC AWARENESS AND COMMUNICATION

Bill Inserts

United Water Delaware has provided a number of billing inserts with conservation topics to customers. United Water, AWWA (American Water Works Association), and partnerships with organizations such as the Delaware Nature Society are a few of the resources that are used for conservation-oriented billing inserts. Tips on conservation, checking for leaks, conservation-minded landscape and water saving tips are just a few ways customers are educated through the use of these bill inserts.

Bill Messages

The re-design of our billing statement in 2005 has provided United Water Delaware the opportunity of communicating more detailed and important messages to customers via bill

messages that are printed directly on the bill. United Water Delaware will be using this larger message area to continue to share conservation messages with its customers.

Website

The United Water Delaware website is an excellent source of conservation information and resources. The website, at <http://www.unitedwater.com/uwde>, has a specialized section dedicated to water conservation.

The United Water website includes a link to the H₂ouse Water Saver Home Website (<http://www.h2ouse.net/>). This is a home tour to explore water saving opportunities that can be captured in various areas around the house. This site educates visitors on the top five actions and methods that can be used to save water. It also includes tips that customers can use to conserve water during stressful periods of drought.

The customer information found in the United Water website includes numerous conservation tips, how to's in searching for leaks, and landscaping ideas using native and drought resistant plants (list provided on the website). United Water Delaware also uses a bill insert, titled **Water Wise Planting**. The text of this insert was written by the Delaware Nature Society and the insert itself was sponsored by United Water. While the insert was mailed to customers in Spring 2005, it is also available for them to download from the website. United Water continues to share this information with customers and visitors in hard copy.

The website also offers the water saver kits to customers that contact our Customer Service Department.

Public Events

The message of conservation is also a part of the display theme that United Water Delaware uses in community events such as the Harvest Moon Festival at Ashland Nature Center, Delaware Days, and Ag Day at the University of Delaware. We have brochures available to educate customers about the Watershed, Water Wise Gardening, Conservation, and conservation facts about water. Our staff is also available at most of these functions to answer questions and offer information. To attract young visitors to our display, we have a duck pond game for the children to win prizes and a water tent available for customers of all ages.

PLANT TOURS / SPEAKER BUREAU (EDUCATION)

We have offered tours of the treatment facility as well as employee speakers that are available to visit organizations and schools to talk about water. Schools and organizations contact us for a speaker or to set up a tour of the Stanton Water Treatment Plant Facility. We work with each group to tailor our presentation to meet the needs and

expectations for their program. Each tour includes a water conservation module as an essential topic.

In our tour presentation, we describe how drinking water is delivered to customers. Depending on the age of the students, we discuss the cost of water, why water conservation is important, and how the students can conserve water. We have various programs on DVD's and videos, as well as brochures to promote conservation. These tools vary for a range of age groups from children to adults. Our tours typically wrap up with a bit of memorable fun in our water saving tent and the children can enjoy going through the mist.

We will be conducting presentations and tours this year to include a survey for the group leader so that we may continue to improve and update the presentations and tools that are used in these forums. We consider each contact with the residents in our communities as an opportunity to emphasize the importance of water in our lives and its role as a precious commodity that should be conserved and used wisely.

SERVICES

Internal Service Lines

The Customer Service and Transmission and Distribution Departments at United Water Delaware are available to check on leaks that are called in by customers who have reported a leak in a main, a hydrant, service line, or inside their home. Should there be any question as to whether something is leaking or its point of origin, the personnel in either of these two departments will visit the property to investigate. This kind of personal service to the customer will help to identify if there is a problem so that it can be repaired in a timely manner. This is beneficial to the customer's peace of mind and it helps to minimize the amount of water that is lost to a leak.

Home Services/Leak Guard

In June 2005, Home Service began to offer their programs and services to our customers beginning with a service agreement on the customer's water service line running from the curb into the house. This program covers repairs or replacement of the customer service line up to \$2500 per incident, twice annually, for a yearly fee of \$54.95.

A program like this is not only beneficial to our customers, it benefits United Water as well. Postponing the repair of a water service line that could be very expensive is not an uncommon practice. The availability of a program like this gives customers reason to act quickly when a problem arises. Leaks can be repaired in a timely manner resulting in the conservation of wasted water. Most recently, an option for protection of inside plumbing is being offered.

System Leak Detection

The United Water Transmission and Distribution Department conducts on-going leak surveys of its water distribution system network. As much of our transmission main resides in remote areas, surveys are carried out annually via a physical and visual inspection. Distribution lines are visually inspected at key points, with the balance of leak detection conducted over time utilizing acoustic techniques plotted on a system map grid. Equipment utilized includes sub-surface leak detection devices, as well as computerized correlation technology.

THE FUTURE PLAN

United Water looks toward the future with conservation in mind. Examples include the installation of a rain garden, planning for a weather station, increasing our public presence, and stepping up communications along with the projects that we are currently undertaking and will continue in the future.

Rain Garden

United Water Delaware has replaced the overgrown landscape in the front of the main office at our Stanton, Delaware site with native species plants that are common to our area. A rain garden, designed to flourish from rain run off, was installed as a real-life example for customers to see when they visit our offices. Because the plants are native in origin, they can withstand the area's seasonal changes in rainfall amounts and survive in times of drought. United Water Delaware will be labeling the plantings and will develop a self-guided tour that customers can take on their own. Also, the garden and landscaping will be used to educate visitors during plant tours.

This garden will be an addition to the treatment plant tours as an example to our visitors of how native plants can save water by the very nature of the plant. We will also communicate this addition on our website for the benefit of our customers.

The plants included in the Rain Garden include:

- ◆ *Athyrium filix-femina* (Lady Fern)
- ◆ *Chelone glabra* (White Turtlehead)
- ◆ *Clethra alnifolia* 'Hummingbird' (Dwarf Summersweet)
- ◆ *Eupatorium dubium* (Three-nerved Joe Pye Weed)
- ◆ *Ilex verticillata* 'Winter Red' (Winterberry)
- ◆ *Itea virginica* "Little Henry" (Dwarf Virginia Sweetspire)
- ◆ *Iris versicolor* (Blue Flag Iris)
- ◆ *Juncus effusus* (Soft Rush)
- ◆ *Lobelia cardinalis* (Cardinal Flower)

- ◆ Osmunda cinnamomea (Cinnamon Fern)
- ◆ Senecio aureus (Golden Ragwort)

Bill Inserts

United Water Delaware has a structured schedule planned for bill inserts. We bill our residential customers on a quarterly basis and have planned conservation-minded bill inserts twice a year, through 2009. Each insert will run the course of the quarter so that each customer will receive one at billing.

The subject matter of the insert will be geared to the season. As an example, the spring quarter topic may be on planting and conservation while the fall insert topic may be on checking for leaks or preparing plumbing for the winter season.

Bill Messages

United Water Delaware will continue to use the "Important Message" section of the bill to keep customers informed about the importance of water conservation. With just a few lines of a conservation tip we will remind customers to conserve. Two, brief and direct conservation tips per year will be printed in the bill message section of the bill. For example, a brief tip may appear as "Water conservation saves a precious resource. For conservation tips, call Customer Service or visit our website at <http://www.unitedwater.com/uwde>."

Telephone Messages

United Water Delaware upgraded its telephone system in 2006. The new technology allows United Water to record informative messages for callers to play automatically as they hold for an available representative. The introduction of the Interactive Voice Response system (IVR) is slated for 2006-2007. The IVR technology will allow customers access to United Water Delaware 24 hours a day, 7 days a week to eventually pay bills, enter meter readings, and check balances on their accounts. Additionally, we foresee this as an opportunity to expand communications with customers by providing them with an IVR option that, if selected, will provide them with auditory conservation messages and tips.

Website

Enhancements to the United Water website are planned to take place in 2006-2007. The Conservation Website will launch in Summer 2006. This website will have water saving kits and devices available for customers to purchase at a discounted rate. There are three kits planned for this new site through Niagra Conservation Corporation. The devices in the kits include items such as low flow showerheads; flow reducing aerators, hose nozzles and the toilet tank bank. There will be sections of the website dedicated to xeriscape gardening, proper lawn watering, tips for conservation, contact telephone numbers, and news and events. United Water will continue to use the website to provide

information about conservation and leak detection services that are available to customers.

The conservation site will be available through our corporate website at <http://www.unitedwater.com/>.

Public Presence

United Water Delaware will increase our visibility in the community over the next three years. We will continue to participate in the Christina River Clean-up and the Harvest Moon Festival.

The goal for our coming years is to invest our time in addition to the continued financial support. We will be looking to community events where we will have the opportunity to educate and inform with our literature, to share the message of conservation one on one, and to interact with the community.

Evapotranspiration Weather Station

This is another project that will be implemented at United Water Delaware in 2006. The weather station is designed to compile weather and water data during the planting season and the information will be available to customers through an internet website and/or by publication in the local newspaper. The "ET number" will be an excellent resource for homeowners to use in determining when it is appropriate to water so that their lawn watering time is done only when it is really needed.

The availability of this kind of information can play a key role in conservation. Our customers will be able to gage the water needs of their lawn as often as on a daily basis.

Program Monitoring

We have developed a scheduling timetable outlining the program, event, or communication as well as the time frame for it to be underway. This will allow United Water to monitor the schedule to insure that we are meeting the plan's commitments.

Additionally, we will continue to monitor and compare residential consumption on a monthly and annual basis. Though it is difficult to confirm that the reason for a drop in the consumption would be solely related to the efforts of this plan, we will look for trends that may link our communications to residential reductions in consumption

The timetable has been included with this plan to show the commitment that we have to this plan. An example of the spreadsheet to be used for monitoring residential consumption has also been included.

The conservation plan we currently practice and the improvements we plan in the future all center on communication. An educated consumer is our best customer.

Consumer Water Conservation Plan Action Timeline

PROJECT	2006			2007				2008				2009	
	2ND	3RD	4TH	1ST	2ND	3RD	4TH	1ST	2ND	3RD	4TH	1ST	2ND
BILL INSERTS		1			1	1			1	1			1
BILL MESSAGES				1			1	1			1	1	
CONSERVATION WEBSITE (Live)		X											
SYSTEM LEAK DETECTION (Early Spring)				MAR → APR				MAR → APR				MAR → APR	
TOURS/SPEAKER BUREAU (As Scheduled)		X	X	X	X	X	X	X	X	X	X	X	X
RAIN GARDEN COMPLETION	X												
GARDEN BROCHURES (Public Relation Manager position filled 2006)					X								
PUBLIC EVENTS (Public Relation Manager to increase events attended)		X				X				X			
ET WEATHER STATION													
CUSTOMER SURVEY							X						
RESIDENTIAL CONSUMPTION (Monitored monthly and annually)	X	X	X	X	X	X	X	X	X	X	X	X	X

Residential Consumption Tracking (Example Spreadsheet)

UNITED WATER DELAWARE RESIDENTIAL CONSUMPTION								
MONTH	CONSUMPTION	BILL INSERT	BILL MESSAGE	SAVER KITS	ADS	SPECIAL	EVENTS	RATIO %
JANUARY	173,847							
FEBRUARY	145,246							
MARCH	162,016							
APRIL	162,461							
MAY	138,289							
JUNE								
JULY								
AUGUST								
SEPTEMBER								
OCTOBER								
NOVEMBER								
DECEMBER								